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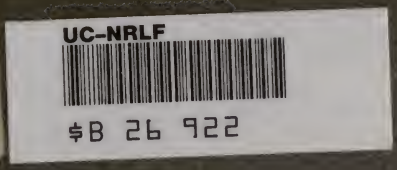

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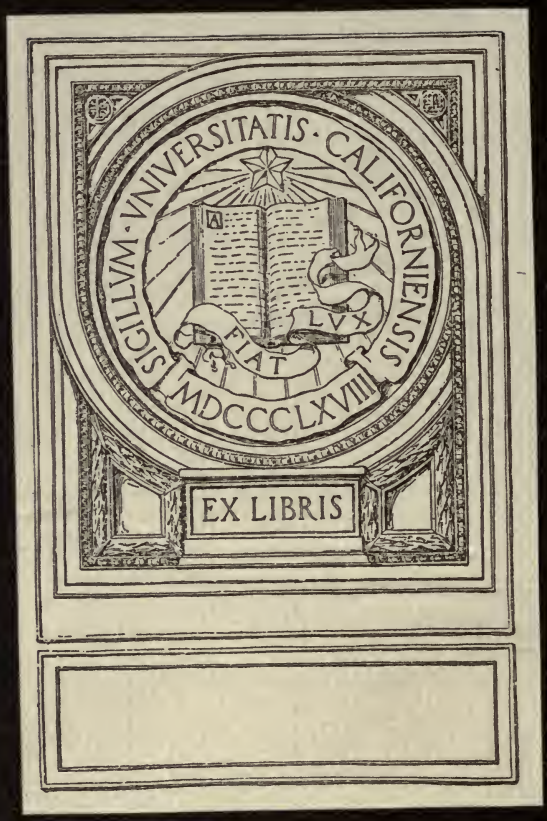
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Wood Preserving Terms

ERNEST F. HARTMAN and E. F. PADDOCK

UNIV. OF CALIFORNIA

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WOOD PRESERVING TERMS

By ERNEST F. HARTMAN and E. F. PADDOCK

Price $1.00

PROTEXOL CORPORATION

34 Barclay Street New York, U. S. A.

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INTRODUCTORY

It is especially to those unfamiliar with the language of the wood preserver that this work purposes to hold out a helping hand.

References are cited to facilitate further inquiry and study. Predominantly wood preservation is an engineering subject. Terms have therefore been included that are of a technical nature as well as the strictly industrial terms.

In many cases, what were originally simple definitions have been expanded and amplified until in its present form, what was intended merely as a glossary of terms, has assumed proportions more nearly approaching those of a text book.

From its inception in 1910 it was gradually developed until in 1917 it was issued to members of our organization as a glossary. Its inclusion in the 1921 Proceedings of the American Electric Railway Engineering Association is testimony of its usefulness.

Especial thanks are due to various individuals of the Forest Products Laboratory for their hearty personal cooperation, to Mr. W. H. Fulweiler for aid on chemical terms, to Mr. C. J. Humphrey for assistance on pathological subjects, to Prof. Samuel J. Record on timber, and to Mr. F. J. Angier on terms used at treating plants.

It is hoped that this work will eliminate the difficulties arising from individual interpretations of terms and lead to a better understanding of the wood preservers language.

THE AUTHORS.

NEW YORK, Feburary 19, 1922.

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WOOD PRESERVING TERMS

By Ernest F. Hartman, Assoc. Am. Soc. C. E. and E. F. Paddock, Chemical Engineer.

absorption — Amount of preservative taken up by or forced into timber during treatment. Commonly expressed in pounds or gallons per cubic foot or per thousand feet board measure. Expressed preferably in pounds or gallons per square foot of surface. (See surface area.) A quantity measure. See initial absorption; gross absorption; net absorption; kick back.

absorption treatment — Steeping, open tank treatment, which see.

absorptive power — The relative ability of timbers to take up preservative liquids. Practically all structural timbers absorb preservative more readily in the sap wood than in the heart wood. End surfaces absorb more than lateral surfaces. The more common timbers when immersed in preservatives absorb the liquid in varying amounts approximately conforming to the following scale in which the absorption by merchantable long leaf yellow pine is taken as 100 per cent:

	Per Cent
Red cedar, poplar, cottonwood	131
Sound square edge long leaf yellow pine, merchantable short leaf yellow pine, loblolly pine, white cedar, hemlock, birch, lodgepole pine	113
Merchantable long leaf yellow pine, prime short leaf yellow pine, jack pine, tupelo gum, tamarack	100
Prime long leaf yellow pine, red oak, chestnut, maple, soft elm, beech, cherry	94
Douglas fir, cypress, white pine, red gum, ash, sycamore	65
White oak, spruce, rock elm	56

Absorption is affected by density of wood structure, seasoning, temperature of treatment, nature of preservative and numerous other local conditions. In pressure treatments absorptive power determines the grouping for various charges, both as to classes and dimensions of timber. In this connection see "Proper Grouping of Timbers for Treating," by F. J. Angier, Proc. Am. Wood Preservers Ass'n, 1910, page 105. See Bulletins 101, 606 and 607, U. S. Dept. of Agriculture, by Clyde H. Teesdale.

abutments — Structures designed to withstand lateral pressure as the thrust of an arch or vaulted ceiling, the impact of ice or the force of currents. In carpentry, a joint in which two pieces meet with their fibres at right angles to each other.

acridine — A colorless, crystalline compound $C_{13}H_9N$ resembling anthracene and occurring with it in coal tar. Melting point 110° C. Boiling point 360° C. Boulton (The Preservation of Timber by the Use of Antiseptics) first mentioned its special germicidal value.

adulteration — The addition without acknowledgment of foreign or antiseptically inert substances to a preservative to cheapen or dilute it.

adzing — A method of framing which consists of removing a layer of wood from a portion of timber to form a bearing surface. Frequent on railroad ties under the rail base. Until recently, usually done by means of a hand adze. Now frequently done by special adzing machines which also square the ends and bore for spikes. See machined ties.

adzing machine — See adzing.

Agaricaceæ — agarics — Fungi producing their spores on the surfaces of radial gills or plates usually on the under side of the fruiting body.

air dry — Seasoned by exposure to the atmosphere until there is no further appreciable loss in weight from evaporation of moisture under average atmospheric conditions. Thoroughly air-dry wood may contain from 8 to 18 per cent moisture, the percentage depending upon the prevailing relative humidity of the atmosphere. Lumber and timber are often considered air dry in practice when they have from 15 to 30 and even higher per cent moisture based on the dry weight of the wood.

air seasoned — Seasoned or dried by exposure to the atmosphere.

albumin — A transparent, viscous nitrogenous substance ($C_{72}H_{112}N_{18}SO_{22}$) found in many vegetable juices and solids. It is non-crystalline and can be coagulated or curdled by heat, alcohol and the stronger acids. It was formerly erroneously supposed that timber was preserved by coagulating the albumin in the wood.

albuminous — Consisting of or containing albumin.

alburnum — See sap wood.

Allardyce Process — A two movement pressure treatment with zinc chloride and creosote consisting of the following steps or movements:

a — Solution of zinc chloride is injected under pressure of 75 to 100 pounds per square inch until an absorption of ¼ to ½ pound of dry salt per cubic foot of timber is obtained.

b — Cylinder is drained and creosote is injected under pressure of 100 to 150 pounds per square inch until an absorption of 3 to 4 pounds per cubic foot is obtained. Process not patented.

American Railway Grade 1 Creosote Oil — The highest quality of creosote oil called for by the specifications of American Railway Engineering Association and American Wood Preservers' Association for creosoted ties and timber.

analysis — A series of chemical and physical tests to determine the physical characteristics and chemical composition of a preservative. These tests may be quantitative or qualitative. The methods employed and the tests performed depend upon the material and the specific use for which it is intended. Since the term analysis is "to separate into component parts," for wood preserving oils this term is

correctly used in the case of such chemical tests as the sulphonation residue or tar acid test. The usual specifications for oils really require only physical tests. Various authorities, associations, producers and consumers have published specifications covering the analyses of preservatives to meet their respective requirements.

analysis, physical — An examination by which are determined the properties of a material without regard to its chemical composition, such as weight, hardness, viscosity, color, taste, odor, specific gravity, fluidity, etc.

analysis, qualitative — An analysis by which is determined the chemical nature or identity of the constituents of a material, regardless of the quantity or amount present.

analysis, quantitative — An analysis by which is determined the quantities of the various chemical constituents present in a material.

anchor pole — A short pole set at an angle, to which guys are fastened. Commonly used in connection with derricks, stacks and on the turns in pole lines. On a trestle or similar structure, the inclined posts which take the thrust of a bumping block.

annual ring — "A tree increases in diameter by the formation, between the old wood and the inner bark, of new woody layers which envelope the entire stem, living branches and roots. Under ordinary conditions one layer is formed each year and in cross sections as on the end of a log they appear as rings — often spoken of as annual rings." S. J. Record — "Mechanical Properties of Wood."

ant — A small insect of the family *Formicidæ*. There are numerous species, some of which cause damage by boring into wood. In wood preservation the term is often incorrectly used to designate the termite or white ant. See termite.

anthracene — $C_{14}H_{10}$, a constituent of coal tar forming shining white scales with violet fluorescence. Melting point 210° C. to 216.5° C. Boiling point 360° C. Insoluble in water but very soluble in light tar oils. When present in excess it crystallizes out of tar oils, forming a crystalline sediment which is redissolved on heating. By the action of sunlight it is partly converted into paranthracene. See "Anthracen," by G. Auerbach.

anthracene cake — The pressed masses of crystalline matter removed from filter presses in the filtration of anthracene oil. Composed of anthracene, phenanthrene and other crystallizable constituents of crude anthracene oil. Used as a base for dyes.

anthracene oil — The highest boiling commercial distillate from coal tar, distilling between 270° C. and 400° C. Its specific gravity is above 1.065 at 15.5° C. The distillate from which anthracene is obtained. Used on account of its toxicity, slight volatility, permanence and non-drying character, in the production of high grade wood preservatives for surface treatments. Also known as green oil, which see.

antiseptic oils — Oils which are poisonous to wood destroying organisms.

antiseptic treatment — Preservative treatment which prevents subsequent infection by fungi and renders the wood unsuitable for the growth and development of fungi or distasteful to boring animals. See Boulton, "The Preservation of Timber by the Use of Antiseptics."

antiseptic zone — That portion of a treated timber which actually contains preservative or any portion of a timber which will not support fungus growth.

aqueous solutions — Chemical compounds dissolved in water.

arbor vitæ (*Thuya occidentalis*) — See cedar, white cedar.

aromatic compounds — Hydrocarbons of benzene series including benzene and its homologues, so called from the characteristic odors of many of them.

ash — (Fraxinus) — Fifteen varieties are found in the United States, six of which are of commercial importance. White ash, red ash, blue ash, black ash, green ash, Oregon ash. Commercially and botanically divided into white and black ash (*F. americana and F. nigra*). Often associated with oak. The name ash is also applied sometimes to the wood of certain varieties of apple, orange, pear, quince and other fruit trees. The following description refers to the true ash. Wood heavy, hard, strong, stiff and quite tough. Not durable in contact with soil, straight grained, rough on the split surface and coarse in texture. The wood shrinks moderately, seasons with little injury, stands well and takes good polish. Ash is used for finishing lumber, stairways, in shipbuilding, in the construction of cars, wagons, carriages, etc., and for ties. The trees of the several species of ash are rapid growers, of small to medium height with stout trunks; they form no forests, but occur scattered in almost all our broad-leaved forests. Takes treatment readily, for which it is grouped with the red oaks.

ash — mineral matter — See ignition test.

bacteria — Simplest form of microscopic fungi consisting of single spherical, rod-shaped or corkscrewlike cells, which reproduce by fission or by endospores. They occur as saprophytes or refuse-eaters and as plant and animal parasites. They are classed with the Schizomycetes. "As yet no wood destroying bacteria have been isolated," Buller on "The Destruction of Wood by Fungi," in Science Progress, No. 11, Jan., 1909.

ballast — The material, whether broken stone, gravel, cinders, sand or dirt, used to form the bed or foundation on which the ties of a railroad track are laid.

barking — Peeling or removing the bark, including the inner bark in the case of piles, poles or pole ties.

barnacles — Crustacea which when mature attach themselves to rocks, timbers, ship bottoms and even to the bodies of marine animals. Their food consists of microscopic organisms found in the water. They do not injure the wood but frequently attach themselves to ship bottoms in such numbers as to impede the progress of the vessel.

barrel thief — An instrument used for taking a sample of liquids from a barrel or other container. A large pipette of glass. Usually consists of a glass or metal tube drawn to a small diameter at each end. Sometimes provided at the lower end with a valve controlled from the upper end by a rod passing through the tube.

basidiomycetes — A group of fungi including most of the edible fungi (e.g. the mushroom).

basswood (Tilia)—Also called linn and linden. Wood is straight-grained, usually light and soft, easy to work, shrinks moderately. Takes treatment readily. See poplar.

bastard grain — See flat grain.

bath treatment — See open tank treatment.

bayonet heater — An electric heating device in the form of a long narrow cylinder that can be lowered through the bung hole of a drum or barrel to heat the contents.

bay poplar — tupelo — See gum.

Beaumé (abbreviated Be°) — The name of a density scale used on glass spindle hydrometers. Frequently used in the United States for the quick determination of specific gravity of liquids. Two of these are used, one for liquids lighter than water and one for liquids heavier than water. Conversion tables give the specific gravity from the number of degrees Beaumé. The conversion formulæ are:

For liquids heavier than water $145 \div (145 - {}^{\circ}\text{Be}) =$ specific gravity.

For liquids lighter than water $140 \div (130 + {}^{\circ}\text{Be}) =$ specific gravity.

beech (Fagus) — There is only one variety (*Fagus ferruginea* or *Fagus atropunicea*), found in America. The names blue beech and water beech are sometimes applied locally to the ironwood. Wood heavy, hard, stiff, strong, of rather coarse texture, white to light brown, not durable in the ground, and subject to the inroads of boring insects; it shrinks and checks considerably in drying, works and stands well and takes a good polish. The beech is a medium-sized tree, common, sometimes forming forests, most abundant in the Ohio and Mississippi basin, but found from Maine to Wisconsin and southward to Florida. Used for ties. Sapwood takes treatment fairly.

beetles — Insects of the order Coleoptera. They have a single pair of wings which are covered by horny wing covers that are raised during flight. More than 11,000 species are known in America. The larvæ or grubs of many of these as well as some of the mature beetles bore in wood and cause considerable damage, both to living trees and lumber. In some localities the pole borer (*Parandra brunnea*) causes serious damage to standing poles.

bent — A transverse frame of a framed structure as a transverse row of poles and bracing in a trestle or dock. A framed section pieced together on the ground and afterward raised into position as a roof truss.

benzol test — A test to determine the percentage of an oil preservative which is insoluble in benzol as free carbon, etc. It is performed in various ways but consists essentially in washing a weighed sample through a filter with heated benzol and determining the amount of insoluble matter remaining on the filter medium.

Bethell Process — Pressure treatment with creosote consisting of the following steps:

a — Preliminary vacuum,

b — Oil injected under pressure from 25 pounds to 180 pounds per square inch,

c — Final vacuum (sometimes omitted).

When green timber is treated it is subjected to a live steam bath of several hours before the preliminary vacuum. Final absoption, 6 to 24 pounds per cubic foot. Process and not the preservative patented by John Bethell in England 1838.

bichloride — See mercuric chloride.

birch (Betula) — There are six American varieties of birch that acquire a size suitable for lumber. The yellow and sweet birches (*Betula lutea* and *Betula lenta*) are the American birches most prized for woods. Wood heavy, hard, strong, of fine texture; sapwood whitish, heartwood in shades of brown with red and yellow, very handsome, with satiny lustre, equaling cherry. The wood shrinks considerably in drying, works and stands well and takes a good polish, but is not durable if exposed. Birch is used for finishing lumber in building and to some extent for ties. The birches are medium-sized trees, form extensive forests northward and occur scattered in all broad-leaved forests of the eastern United States. Takes treatment readily.

bitumens — Mixtures of native or pyrogenous hydrocarbons and their non-metallic derivatives, which may be gases, liquids, viscous liquids or solids, and which are soluble in carbon disulfide. A. S. T. M.

bituminous — Containing bitumen or constituting the source of bitumen. A. S. T. M.

black gum (*Nyssa sylvatica*) — See gum.

black oak (*Quercus velutina*) — See red oak.

blast furnace tar — Tar obtained as a by-product in the manufacture of steel in the blast furnace process. This is characterized generally by the very high percentage of tar acids.

bled timber — Timber from pine trees which have been turpentined.

bleeding — The exuding of oily preservatives from timber under the influence of heat. Causes considerable trouble in heavily treated cross-arms and paving blocks due to expansion of the included air which drives out the preservative.

blight killed timber — Timber cut from chestnut trees that have been killed by the chestnut blight.

blotter test — A crude test for solid matter in a liquid. A drop of the liquid is placed upon a clean piece of blotting or filter paper and allowed to spread. Any solid matter in the liquid will not be absorbed by the blotter but will remain to form a spot, of the size and shape of the original drop. Very small percentages of solid matter will make quite appreciable spots in this way. Water, if present in any quantity may also be detected in this way. Also known as spot test.

blue stain — bluing — The result of fungus action on the sapwood of both conifers and hardwoods producing a grayish-blue discoloration. Since this fungus lives mainly on starches, sugars, etc., and but rarely bores through the walls of the fibers it does not affect the strength of the wood. It is objectionable on account of the discoloration. See sap stain.

blue vitriol — See copper sulphate.

board — Sawed lumber 1 inch in thickness and 4 inches to 12 inches in width. Sometimes applied to pieces of all widths.

board foot — See board measure.

board measure — A system of measuring lumber and timber, the unit of which is the board foot. A board foot is a piece of timber 12 in. by 12 in. by 1 in. or an equivalent volume = 1/12 cubic foot = 144 cubic inches. The "board feet" or "feet B. M." in a piece of timber is determined by taking 1/12 of the product of the width and thickness in inches and the length in feet, the product of the thickness in inches, the width in feet and the length in feet, 1/12 of the product of the end area in square inches and the length in feet, or the product of the area of one face in square feet and the thickness in inches.

body — Consistency, thickness, substance. A property of liquids particularly oils or paints, closely allied to viscosity.

boiling point — The temperature at which a liquid is converted into a vapor (gas) with ebullition (boiling).

Boiling Process — Patented by Curtis and Isaacs in 1895. See oil seasoning.

bolster car — A car consisting of a truck with a central pivot bearing a "U" shaped arm with a single bale. At creosoting plants bolster cars are placed under the ends of long timbers to facilitate movement on curved track.

bone dry — See oven dry.

bored ties — Ties with holes bored in them to receive driven or screw spikes. Ties should be bored for spikes before treatment to insure completely treated wood around the spike thus guarding against loosening of the spikes in service as a result of decay at this point.

borers — See marine borers.

boring — See adzing, bored ties, machined ties.

Boucherie Process — Impregnation with solution of 1 pound sulphate of copper to 12½ pounds of water, by pressure through a cap with pipe connections to one end of a timber and forcing the preservative through by pressure (usually hydrostatic). About 80 to 100 hours required for solution to traverse the length of a tie. First used by Boucherie by vital suction in 1838. Best results obtained on freshly cut logs with bark still on. Patented 1838–1841. Still used in Europe, notably in France. For full description see Britton, "Dry Rot in Timber" or "Traite de la Conservation des Bois," by Paulet.

box-heart tie — An "all-heart" tie with the pith of the tree at or near the centers of the ends of the tie. (Known also as "rifle" or "target" tie.) A. R. E. A.

bridge ties — Cross ties for use on bridges and trestles. Usually of larger dimensions than standard ties and nearly always sawed. A common size is 8 in. by 10 in. by 10 ft.

bright sap — Sapwood not stained by fungus.

broadleaf — See hardwood.

brush treatment — The application of a liquid preservative to the surface of timber by means of a brush. Oily preservatives are usually heated.

buckling — The lifting, tilting or tipping of boards or blocks, due to lateral pressure caused by swelling from moisture or heat. Sometimes occurs in floors or wood block pavements when sufficient expansion joints are not provided.

buggy — See cars.

bulkhead — A partition in a vessel to separate it into water tight compartments. A retaining wall to hold back earth as in a mine, a tunnel or along a water front.

Burnettizing — Burnett Process — In modern practice pressure treatment with zinc chloride solution (varying strength up to 5 per cent) consisting of the following steps or movements:

a — Preliminary vacuum,

b — Zinc chloride solution injected under pressure of 100 to 175 pounds per square inch.

When green timber is treated a preliminary steaming of 1 to 5 hours at about 20 pounds pressure is employed. Absorption ¼ to ½ pound of dry zinc chloride per cubic foot. The use of zinc chloride was patented by Sir William Burnett in England in 1838. Original patent covered open tank treatment in zinc chloride solution (2 to 4 per cent) for from 10 to 21 days. Use of pressure is a later development. See zinc chloride.

burning point — The minimum temperature to which a substance must be heated in order to burn continuously when ignited. See fire test.

butt — The base of a tree or the large end of a log. In poles the portion entering the ground.

Butt Pressure Process — A process for preserving pile or pole butts under pressure by enclosing the butt in a cylinder, closed about the timber by an oil tight joint. The cylinder is then filled with heated preservative and pressure is applied until the specified absorption or penetration is obtained. Particularly adapted to treatment of piling after driving and framing. For full description see Proceedings of American Wood Preservers' Association 1921.

butt treatment — Preservative treatment applied to one end of a timber, usually the lower or butt end of a post or pole or the exposed end of a pile. See full, partial and special butt treatment.

cable box — A case or box used as a receptacle for the terminals or ends of electric cables.

cage — A box or container made of perforated metal or grating, used as a container for small pieces such as paving blocks during treatment. In retort treatments, these cages are mounted on cars. See car.

caliper measure — A method of measuring square or roughly hewn timbers. The thickness and breadth are measured in inches at the middle and the cubic contents calculated according to the formula:

$$\frac{\text{breadth} \times \text{thickness} \times \text{length in ft.}}{144} = \text{contents.}$$

Width and breadth are measured to the nearest ¼ inch. In logs containing less than 5 cubic feet the length is measured to the nearest ¼ foot and the contents to the nearest 1/10 cubic foot. Logs containing over 5 cubic feet, 8 inches square or under 10½ feet long are measured to the nearest ½ foot in length and the contents to the nearest ½ cubic foot. Logs over 9 inches square and over 10½ feet long have the length measured to the nearest ½ foot and the contents in cubic feet, rejecting all fractions.

cambium layer — See exogenous.

canyon oak — (*Quercus chrysolepis*). See live oak.

cap — (a) An apparatus fitted tightly over the end of a timber by means of which preservative is injected longitudinally. See Butt Pressure Process.

(b) The uppermost member of a framed structure. A horizontal timber which rests upon the ends of vertical timbers, such as piles or studding.

capillary attraction — The action by which the surface of a liquid in contact with a solid is elevated or depressed, due to the surface tension of the liquid and the angle of contact the liquid makes with the solid. The angle of contact depends upon the nature of the solid and the third material which exists above the free surface of the liquid. Particularly noticeable in very fine (capillary) tubes in which the liquid will stand considerably above or below the surface of the surrounding liquid; also in closely matted masses of fine fibres as in wood, cloth, felt or blotting paper and where smooth surfaces are nearly in contact as two sheets of glass or metal standing in a liquid. See diffusion.

carbolineum — A coined name that through laches (neglect) has become generic as descriptive of anthracene oil preservatives. A loose term denoting no specific quality.

Card Process — Pressure treatment with a mixture of a water-soluble salt and oil, for instance zinc chloride and creosote oil. The mixture is kept uniform by means of a rotary pump. Mixture is made in such proportion that there will be left in the wood after pumping to refusal ½ lb. of salt and 2 to 3 lbs. of oil per cubic foot. The use of steam, vacuum and pressure are the same as in the Bethell Process. Patented by J. B. Card in U. S. A., 1906.— F. J. Angier.

cars — Tram cars — cylinder cars — bolster cars — retort cars — buggy — small cars with "bails," iron hoops or chains on which timber to be treated is loaded and pushed into the treating cylinder. For paving blocks cages are mounted on the cars or tie cars are covered with perforated sheet iron.

car timbers — Car framing, including upper framing; car sills. A. S. T. M.

casehardening — The formation on timber of a casing or surface layer of hardened wood due to rapid drying and shrinking of the portions at or near the surface and exposed to the air. "By case-hardening is meant that the surface dried more rapidly than the interior and became set in an expanded condition and as the interior dried its tendency to shrink away from the set outer shell produced internal stresses" Arthur Koehler. See internal checking.

cedar — A name first applied to the true or Lebanon cedars (*Cedrus*) and later to certain arbor vitæs (*Thuya*), junipers (*Juniperus*) and cypresses (*Chamæcyparis*) from which durable, fine grained, more or less fragrant woods are obtained. Cedar timber is light, soft, stiff, not strong, of fine texture; sap and heartwood distinct, the former lighter, the latter a dull, grayish brown or red. The wood seasons rapidly, shrinks and checks but little and is very durable. Used like soft pine, but owing to its great durability preferred for shingles, etc. Small sizes used for posts, ties, etc. Cedars usually occur scattered, but they form forests of considerable extent in certain localities. Takes treatment very readily. See red cedar, white cedar.

Celsius — See Centigrade.

Centigrade — The system of temperature measurement universally adopted for scientific purposes and rapidly coming into general use. By this system the freezing point of water is called zero and its boiling point 100 degrees. One degree Centigrade is the equivalent of 1/100 of the difference between the temperature of melting ice and boiling water. Centigrade = 5/4 Reaumur = 5/9 (Fahrenheit — 32). Also called Celsius from its inventor.

centre-sawed — See quarter sawed.

charge — All the timber placed in the treating tank or cylinder for treatment at one operation. Used in connection with pressure and open tank treatments.

charring — Partial burning or conversion into charcoal of the surface portions of a piece of timber. Popularly supposed to possess wood preserving value. It is somewhat effective in destroying surface infection but does not prevent subsequent decay or have any lasting value.

check — A check is a separation of the wood cells along the radial plane of the tree commonly due to unequal shrinkage during seasoning.

checking — The opening up of checks, cracks or fissures in timber due to shrinkage in seasoning. See internal checking.

Chelura — See marine borers.

chemical treatment — Preservative treatment of wood by means of chemical substances such as oils or salt solutions as distinguished from seasoning, ventilation, heat treatments, charring, etc.

Chêne vert — (*Quercus virginiana*). See live oak.

cherry (Prunus) — The widely distributed wild cherry or wild black cherry (*Prunus serotina*) supplies the cherry wood of commerce. This wood is strong, hard, fine-grained and red-colored and durable. Takes treatment fairly with good penetration.

chestnut (Castanea) — The common chestnut (*Castanea vulgaris*) valued for its wood, its tannin and its fruit. Wood light, moderately soft, stiff, not strong, of coarse texture, the sapwood light, the heartwood darker brown. It shrinks and checks considerably in drying, works easily, stands well and is very durable. Used for railway ties, telegraph poles, and locally in heavy construction. Medium-sized trees, very common in the Alleghanies, occurs from Maine to Michigan and southward to Alabama. Chinquapin (*Castanea pumila*): A small sized tree, with wood slightly heavier but otherwise similar to the preceding; most common in Arkansas, but with nearly the same range as the chestnut. Chinquapin (*Castanopsis chrysophylla*): A medium-sized tree of the western ranges of California and Oregon. Rapidly becoming extinct as a result of a disease commonly known as chestnut blight. See blight killed. Takes treatment well in the sap wood, the heartwood resistant. Often grouped with red oak for treatment.

chestnut oak (*Quercus prinus*) — Usually classed with white oak but unlike the others of this class it takes treatment well and can be grouped with the red oaks for treatment. See white oak.

Chinquapin — See chestnut.

chlorinated oils — Oils that have been subjected to the action of chlorine during manufacture.

chlorine — chlorin — At atmospheric pressure and ordinary temperatures chlorine is a gas which chemically is very similar to bromine and iodine. It is heavier than air, greenish yellow in color, and has a distinctive and very powerful odor. In combination with coal tar oils it serves to increase their efficiency as wood preservatives by increasing toxicity, specific gravity, viscosity and making them less

inflammable. Also improves the color. See "Investigations of the Germicidal Value of Some of the Chlorin Disinfectants," by F. W. Tilley.

Christiana Standard — A European lumber measurement based on a unit 1¼ inch by 9 inch by 11 feet equal to 10 5/16 feet board measure. One hundred and twenty Standards equal one Christiana Standard Hundred, equivalent to 1,237½ feet B. M.

clamp — A short wooden plate fastened to the side of two abutting timbers to strengthen the joint and prevent lateral motion. Also frequently referred to as a fish plate. See "Structural Details" by H. S. Jacoby.

clapboard — Laterally overlapping boards usually thicker at the lower edge than at the upper, used for the walls of buildings. Sometimes used to describe long split shingles also known as "shakes".

clear lumber — Lumber practically free from defects. See Standard Defects.

cleat — A strip of wood or metal fastened across other timbers or boards to strengthen, clamp, prevent slipping, etc. Also a small board or block nailed to a wall or post as a support for a shelf, on a floor to hold a diagonal brace or as a foothold on a sloping floor.

Cleveland Open Cup Tester — Apparatus for flash and fire point tests for oils flashing above 80° C. See A. S. T. M. Tentative Standard, 1920.

clipped board — A board trimmed square at the ends.

close grain — A common meaning is having the annual rings comparatively narrow indicating a slow rate of diameter growth, although there is no definite number of rings per radial inch which defines close grain. Close grain is also, but less often, used with a different meaning, namely having very small pores, e. g. maple. Close grained wood, according to these meanings is not necessarily dense, e. g. slow growing basswood or even yellow pine.

close grained — Having the annual rings relatively close together or narrow, indicating a slow rate of growth. Ten or more rings per radial inch is considered close grained wood. See dense wood.

coagulation — The process of changing a liquid into a clot or jelly as by heat or chemical action. Curdle, congeal.

coal gas tar — See gas tar.

coal tar — Tar obtained as a by-product from the destructive distillation of bituminous coal in the manufacture of coal gas or coke in by-product ovens. See tar.

coal tar creosote — Creosote oil distilled from coal tar. See creosote.

coal tar oil — Oils obtained in the distillation of coal tar. Frequently used to describe mixtures of creosote oil and coal tar, also known as creosote coal tar solution, which see.

coal tar solution — See creosote coal tar solution.

coarse grain — Term applied to lumber of rapid growth, having wide annual rings.

coefficient of expansion — A factor representing the increase in volume of a liquid for each degree of temperature, to be applied where the specific gravity is taken at higher or lower temperature than that specified. For coal tar creosote oil the accepted factor is .0004444 per degree Fahrenheit (.0008 per degree C.) deduced from the increase or decrease in volume of 1 per cent at 100 deg. F. for each 22.5 deg. F. For anthracene oil the factor obtained by direct experiment is .00038 per degree Fahrenheit or .000684 per degree Centrigrade. The coefficient of expansion of coal tar oils decreases as the density of the oil increases almost in direct proportion. See "The Testing of Creosote" by C. Edward Sage, Journal of Chemical Industry (London), Vol. XXIX, No. 10.

coffer dam — A temporary enclosing dam built in the water and then pumped dry to allow work to be performed on the bottom. Also a similar structure attached to a ship's side to allow repairs below the water line.

coil — steam coil — heating coil — A heating device consisting of a pipe or series of pipes immersed in preservative in a tank, cylinder or other container. The preservative is heated by passing steam through the coil.

coke oven tar — Coal tar obtained as a by-product from the destructive distillation of bituminous coal in the manufacture of coke.

coke test — A test to determine the non-volatile matter including the mineral matter which constitutes the ash in an oil. Performed by distilling a small weighed sample in a glass bulb shaped like a retort and then increasing the temperature to a red heat. The bulb and contents (coke) are then cooled in a dessicator and weighed. The difference between this weight and that of the bulb is the coke and is usually expressed as a percentage of the weight of the original sample.

cold bath — Immersion of timber in an open tank of preservative at approximately atmospheric temperature.

Colman Process — A steaming process used almost exclusively for the treatment of Douglas fir piles and described as follows by the American Railway Engineering Association: "The timber shall be first steamed at a pressure of 90 lb. to 100 lb. per sq. inch for three to ten hours. The steam shall then be released and a vacuum drawn until the timber is considered seasoned. This sometimes requires from 18 to 20 hours. The temperature within the cylinder during the vacuum period shall be maintained above 200° F. The oil shall be injected at a maximum pressure of 100 lb. to 150 lb. per sq. in. until the desired absorption is obtained."

comb-grained — The best quality of quartersawed lumber, the growth rings of which are practically at right angles to the face of the piece. Term usually applied to flooring.

combination treatment — A preservative treatment in which two preservatives are used as in the Allardyce and Card Processes among the pressure treatments and the Hartman Process which may be either pressure or open tank. The Guissani Process (open tank) is also a combination treatment. The principle of such processes is to treat the timber with a mineral salt solution which is prevented from leaching from the wood by a protecting coating of a non-soluble oil preservative.

combustion loss — The loss in weight of a timber as a result of burning. Determined experimentally by raising the temperature of the test piece in a suitable furnace until it ignites and then removing it and allowing it to burn until the flame is extinguished. Care should be taken to protect the piece from draughts during combustion, at the same time allowing an ample supply of air. The combustion loss is usually expressed as a percentage of the original weight of the test piece. The presence of the preservative in treated woods has a very marked influence on the combustion loss, in most cases reducing it. See Proc. American Wood Preservers' Assn., 1915, page 228. Also "The Creosoting Industry with Relation to the Fire Hazard" by Herman von Schrenck in Quarterly of N. F. P. A., April, 1918. See "Tests to Determine the Commercial Value of Wood Preservatives" by Howard F. Weiss, Eighth International Congress of Applied Chemistry, Vol. XIII, page 279.

common boards — In southern yellow pine this term applies to four grades of 1 inch lumber inferior to "Finishing" in widths by even inches from 8 inches to 12 inches. In Pacific Coast woods the widths range by even inches from 4 inches to 12 inches. The term "common" is used by a number of associations for woods manufactured by their members. See "How Lumber is Graded" by H. S. Betts, Cir. 64, U. S. Dept. of Agriculture.

common dimension — In southern yellow pine, 2 inch stock ranging in width from 4 inches to 12 inches by even inches. In Pacific Coast lumber this classification also includes 3 inch stock from 6 inches to 12 inches wide in even inches. See "How Lumber is Graded" by H. S. Betts.

condenser — (a) A pipe or receptacle surrounded by or containing a cooling device in which the vapors from a distilling apparatus are cooled and condensed into liquids.

(b) A device used in connection with a pressure cylinder or vacuum pump to remove and condense exhaust steam, oil vapors, etc., during steam and vacuum treatments.

conductivity — The ability to conduct or permit the passage of heat or electricity.

conduit — A passageway, particularly a tube or pipe for conducting electric wires, cables, steam pipe or the like.

conifer — Term applied to the gymnosperms, the cone bearing woods or needle leaf woods. Commonly called softwoods. The term is

somewhat misleading since some (the yews) do not bear cones. Includes pines, firs, Douglas fir, cedars, hemlocks, cypresses, balsams, spruces, larches, tamaracks, redwood and yews.

Coniophora cerebella (*Coniophora puteana*)—A very common, widespread and dangerous fungus, attacking both coniferous and hardwood timbers in factories, mills, mines and structures of all kinds. It grows very rapidly. Family Polyporaceæ. Fruiting body of the encrusting (resupinate) type, fleshy and often extensive. Surface smooth or covered with rounded tubercles. Often confused with *Merulius lacrymans*. (C. J. Humphrey in "Decay in Coniferous Timber"). See "Handbuch der Technischen Mykologie" by F. Lafar, chapter 2, "Holzzerstoerende Pilze and Haltbarmachung des Holzes" by C. Freiherr von Tubeuf.

conk — See mushroom.

consistency — The degree of solidity or fluidity of bituminous materials. A. S. T. M.

Constantine measure — A system of measurement used in the New York market by which 2 inches are deducted from one face and 1 inch from the face at right angles to it. If the log is defective the contents are reduced one-half. Used in measuring square hewn foreign woods such as mahogany and cedar.

construction timber — A term frequently but incorrectly used to describe structural timber, which see.

contact surfaces — Any portions of the surface of a timber which are in continuous contact with other surfaces of any kind as masonry, concrete, metal plates or other timbers as at joints, splices or bearings.

continuous coil — A steam or condenser coil made of a single piece of pipe bent into a coil in order to avoid the use of fittings and joints with consequent danger of leaks.

copper sulphate — blue vitriol — A salt formed by the action of sulphuric acid upon copper. Recommended by De Boissie and by Bordenave in 1767. Used as a preservative in the Margary Process (Margarizing 1837) and Boucherie Process. The use of this preservative is now largely confined to France.

corrosion — Gradual disintegration of the surface of a substance by chemical action. Often produced by the action of metallic salt solutions upon spikes, bolts or metals in contact with wood treated with these salts causing loss of holding power in spikes or bolts, loosening of plates, etc.

corrosive sublimate — mercuric chloride — bichloride of mercury — bichloride — A chemical salt formed by the combination of mercury (quicksilver) with hydrochloric (muriatic) acid. Used as a preservative in Kyanizing Process.

cottonwood (*Populus deloides*) — Light, soft, weak, liable to warp and difficult to season, not durable. Occasionally used for ties. Takes treatment readily. See poplar.

coumarone — A heavy oil C_8H_6 occurring in coal tar.

Country oils — British creosote oils not produced in the London district.

creosote — creosote oil — Commercially this term refers to oils distilled from coal tar between 230° C. and 270° C. Its specific gravity ranges from 1.000 to 1.065 at 15.5° C. Frequently used to describe oils distilled from water gas tar or mixed tars and for residual oils without regard to specific gravity or quality. A rather loose term requiring amplification to denote a specific meaning. Sometimes also called distillate oil and dead oil of coal tar. Much misunderstanding exists as to the meaning of the term "creosote". It is defined by the Standard Dictionary as "a colorless to yellowish oily liquid compound consisting of a mixture of phenols distilled from wood, and having a smoky odor and burning taste. It is a powerful antiseptic and is used for the preservation of timber, meat, etc.; called also oil of wood-tar and oil of smoke". Allen, in his Commercial Organic Analysis says: "The name 'kreosot' was first applied by Reichenbach in 1832, to the characteristic antiseptic principle contained in wood-tar. Carbolic acid was discovered soon after by Runge in coal-tar, and was long confused with the wood-tar principle; and the crude carbolic acid from coal-tar is still known as 'coal tar creosote'. Somewhat similar products are now obtained from other sources so that much confusion has arisen. The term 'creosote' when used without qualification, ought to be understood as signifying the product from wood-tar, but it is better to describe Reichenbach's body as 'wood-tar creosote', and employ the unqualified word 'creosote' in a generic sense as meaning the mixed phenols and phenoloid bodies obtained from wood-tar, coal-tar, blast-furnace tar, shale oil, bone oil, or other sources".

In its original meaning, therefore, the term "creosote" was applied to a product obtained from wood, and the term is still used thus in pharmacy, and refers to a refined product derived from the destructive distillation of wood.

In the production of disinfectants or oils for flotation purposes the term creosote oil refers to acid oils which are not here defined.

The first mention of the products of the distillation of gas-tar, to be used separately for impregnating timber, appears to be by Franz Moll. This inventor took out a patent in 1836 for injecting wood in closed iron vessels with the oils of coal-tar first in a state of vapor, and next with the heated oils in the ordinary liquid state. He recommended the adoption both of the oils lighter than water, and of the oils heavier than water, calling the former "Eupion", and the latter "Kreosot". He relied upon the Kreosot for its antiseptic qualities, but proposed to use the light oils separately at the commencement of the operation, for the purpose of facilitating the absorption of the heavy oil.

With the development of both the wood-preserving and the coal-tar industries, the term "creosote oil", frequently abbreviated to

"creosote", gradually came to be applied to the heavy distillates from coal-tar, and the use of the term has become more and more extended until, at the present time, it is commonly used in referring to the distillates heavier than water from any tars or tar-like substances, and is even erroneously used to cover products containing admixtures of undistilled tar or pitch. As a result of this lax use of the word it conveys but little to those conversant with the subject and is confusing to those unfamiliar with commercial practice. More specific terms are evidently needed to properly differentiate between the various creosotes. The most useful classification from the wood preserver's point of view would be one based upon the merits of the various products, but lack of sufficient data renders this impossible at this time. The most practical classification at present must be based upon the source and method of production.

"Technically speaking, the fraction of oil passing over between 240° and 270° C. during the first distillation of the crude coal tar is known as 'creosote oil', 'heavy oil', or 'dead oil of coal tar'. In practice, however, the oily residues which remain after extracting carbolic acid, naphthalene, and anthracene from the various distillates in which they occur are added to the creosote oil, and in consequence, many of the creosote oils of commerce contain considerable amounts of materials having boiling points higher than 270° C. and lower than 240° C. As a matter of fact, it is the practice at nearly all distilling plants to add to the 'creosote well' or tank all those oils and residues which can not profitably be worked over and used to greater commercial advantage.

The solvents which are used in the purification of naphthalene and of anthracene are sometimes added to the 'creosote well', and this accounts for the occasional presence of paraffin oil in creosote." Forest Service Circular 98 — "Quantity and Character of Creosote in Well Preserved Timbers" Gellert Alleman.

creosote coal tar solution — Solutions of refined coal tar or coke oven tar in creosote oil in various proportions. Sometimes filtered. Usually mixtures of tar with creosote oil. Standard wood preserving specifications call for a solution consisting of 80 per cent distillate oil (creosote oil) and 20 per cent of refined or filtered coal gas tar or coke oven tar limiting the content of free carbon to 6 per cent. Coal tar oils for paving blocks usually consist of mixtures in the proportion of 65–35 and a maximum content of 10 per cent free carbon.

creosote process — See Bethell Process.

creosoting — The art of impregnating wood with creosote oil by any of the pressure processes.

cresol (cresols) — Occurs in the light creosote oils distilled from coal tar. Exists in three isomeric forms: ortho, meta and para. The formula for each is identical, C_7H_8O but they differ in chemical and

physical properties. Resembles carbolic acid. Used principally in the manufacture of disinfectants.

cresylic acid — Commercial name for cresols. Contains cresols, xylenols and higher members of the phenol series.

cribbing — Timbers used in forming a loose or open pile usually used as a temporary support for a structure or to hold loose earth or stone as in a wharf or a mine. Timbers piled, with air spaces between, in layers laid at right angles to each other.

crimped joint — A soldered joint between two sheets of metal made by bending the edges and locking them together in such a way that a certain amount of expansion can take place without breaking the solder bond.

crinkle iron — A metal strip thinner at one edge than at the other and bent in return bends or zig-zag form. Driven into the ends of timber to prevent the formation or spreading of seasoning checks. See S-hook.

cross arm — A horizontal beam attached to a pole for the support of the insulators of electric light, or other electric wires. N. E. L. A.

cross section — See transverse section.

cross-tie — That transverse member of a railway track which supports the rails and by means of which they are retained in position. See also tie.

crude oil — Petroleum or mineral oil as it comes from the well.

crushing strength — The ability of a short block to sustain a slowly applied load. It is obtained by dividing the load obtained in the test by the area of cross section of the block.

crystallization — Crystallization is the separation of solid matter in the form of crystals from a mother liquid, holding it in solution; usually accomplished by cooling or evaporation. For example, an oil saturated with naphthalene or anthracene at a warm temperature will deposit crystals when cooled to a low temperature and that in proportion to the saturation.

Cuban pine (*Pinus caribæa* Movelet, *Pinus heterophylla* Sudworth) — Nomenclature: (Sudworth) Slash pine, pitch pine, she pine, swamp pine, bastard pine, meadow pine, spruce pine.

Wood similar to long leaf pine from which it is rarely separated, color more pink than longleaf pine, annual rings 10 to 20 per inch, more resinous than longleaf pine but similar in strength, uses, durability and susceptibility to treatment. See hard pine, pine.

cull — A piece of timber rejected as worthless.

cylinder — See treating cylinder. Retort.

cylinder cars — See cars.

cypress (Taxodium) — This name is applied to but one American specie which however is called by various local names. Bald cypress (*Taxodium distichum*). Wood in appearance and quality similar to white cedar. It is light and soft, but not strong. Very durable. Used for ties, poles, construction, tanks, wood pipe, etc. Black cypress and

white cypress are heavy and light forms of the same species. The cypress is a large deciduous tree, occupying much of the swamp and overflow land along the coast and rivers of the Southern States. Does not take treatment readily. See pecky.

D. & M.— Dressed and matched.

Dædalea quercina — A fungus occurring in the eastern United States on oak and chestnut ties, poles, bridge timbers, etc., which it rapidly destroys. Family Polyporaceæ. Fruiting body, a tough corky thick bracket, white when young but becoming gray. Under side white. Pores are very large and instead of being simple perforations take the form of long winding and branching slits forming a labyrinth.

Daldinia concentrica — A fungus attacking maple, elm and other hardwoods. Family Xylariaceæ. Fruiting body more or less globular buttons 1 in. to 2 in. in diameter. Interior black, resembling charcoal, exterior smooth and black with a greenish tinge. The brown spores are borne in small cavities just beneath the surface and ooze out through minute openings, discoloring the surrounding wood.

dap — A term used in lumber framing to designate notching one timber over another as in the case of wooden guard logs on bridges.

dating nail — A large headed nail (usually galvanized or copper) on which numerals of the year are stamped. Sometimes lettered to identify treated or untreated timbers or ties. Driven into ties or timber as a record of the year in which they were placed or treated.

deadman — Logs or timbers buried in the earth to serve as anchors for guys.

dead oil of coal tar — See creosote.

deal — Term used in southern yellow pine export trade. Pieces 9 inches in width and up by 3, 4 or 5 inches in thickness. Any piece 3 inches and up in thickness is known in the English markets as a Quebeck Deal. In England, a piece of lumber 12 ft. or more in length, from 6 inches to 11 inches wide and 2½ inches to 4½ inches thick.

decay — The decomposition of wood caused by living organisms known as fungi. Rot.

deciduous — See hardwood.

defects — See Standard Defects.

dehydrate — To remove moisture. Frequently necessary with tars or oils to prevent frothing and spattering during distillation or on heating above 100° C. in tanks or buckets. Usually accomplished by long continued heating to a point just below 100° C. by which moisture is removed by evaporation.

dehydrated tar — Tar from which all water has been removed.

deliquescent — Capable of becoming liquid by the absorption of moisture from the atmosphere. A property possessed by certain extremely hygroscopic salts such as sodium hydroxide and zinc chloride.

dense Southern yellow pine — See hard pine.

dense wood — Dense means compact, heavy (when dry), containing much wood substance in small space. For example, hickory is a very dense wood. A grade of yellow pine timber defined by the American Society for Testing Materials: "Dense wood is defined as follows: Having the following characteristics showing on the cross-section and appearing in the third, fourth and fifth inches of a radial line from the pith or heart center an average of 6 annual growth rings per inch, provided that in the greater number of rings ¼ or more of the ring is summerwood; an average of 6 or 7 rings, provided that in the greater number of the rings ⅓ or more of the ring is summerwood; or wider ringed material if in the greater number of rings, ½ or more of the ring is summerwood; and must show a sharp contrast in color between springwood and summerwood." For further details see Proceedings A. S. T. M., Vol. XV, Pt. 1 and amendments in 1921 proceedings. See also specifications of Southern Pine Association and West Coast Lumber Association. See hard pine, springwood, summerwood. See also density rules for grading Douglas fir on page 704, part I, Vol. XX, Proc. A. S. T. M.

density — In Physics — Density is the weight (or mass) of a substance per unit of volume. It is proportional to specific gravity but not equivalent to it. (See specific gravity). In Forestry — The term density is commonly used to denote the relative proportion of summer or late wood in a timber.

Density Rule — Specifications for grading southern yellow pine timber and Douglas fir of the American Society for Testing Materials, etc. See dense wood. Also rings per inch rule.

diffuse-porous — Diffuse-porous woods are those in which the larger vessels or pores are distributed throughout the annual ring instead of being localized in a band or row as in ring-porous woods. Gum, yellow poplar, birch, maple, basswood and willow are good examples. See ring-porous.

diffusion — The gradual spreading of preservative through the wood structure after treatment due to gravity, capillary action, temperature variation, etc.

dimension sizes — A grade of timber described as follows in the 1918 Interstate Rules for the Classification and Inspection of Yellow Pine Lumber:

"All square lumber shall show two-thirds heart on two sides and not less than one-half heart on two other sides. Other sizes shall show two-thirds heart on faces and show heart two-thirds of length on edges, excepting when the width exceeds the thickness by three inches or over, then it shall show heart on the edges for one-half the length.

"Stepping shall show three corners heart, free from shakes and all knots exceeding half-inch in diameter, and not more than six in board.

"Rough edge or Flitch shall be sawed from good heart timber, and shall be measured in the middle, on the narrow face, free from injurious shakes or unsound knots.

"Wane on not over 5 per cent of the pieces in any one size shall be allowed as on merchantable quality".

The standardization of terms such as this has been undertaken by the National Lumber Manufacturers' Association (Washington, D. C.) in co-operation with the Forest Products Laboratory. Classifications have been recommended. (Aug. 1921).

dinitrophenol — See nitro phenols.

dip — To immerse in a solution designed to prevent sap stain. Also the solution used for this purpose. Frequently used to denote a short immersion in a wood preservative. See dipping.

dipping — Treatment by means of a short immersion (usually 1 to 2 minutes). Equivalent in effectiveness to careful two coat brush treatment.

disintegration — A term incorrectly used in wood preservation to denote the destruction of wood by fungi. Rot — Decay. More properly, destruction by mechanical wear, weathering, etc. A physical rather than a chemical action.

distillate oil — See creosote.

distillation — See fractional distillation.

distilled oils — Oils obtained by distillation from various substances and usually named for the crude material from which they are distilled as coal tar oil, wood tar oil, etc.

distilling flask — See flask, distilling.

dog ear — See mushrooms.

dolly — A small frame or platform mounted on a single wide roller used as a truck in moving heavy timbers.

dote — (Standard Defect). See rot.

doty — Affected by a fungus disease. Softened as a result of decay. The term doty usually refers to timbers that have spots or pockets of softened decayed wood.

Douglas fir (Pseudotsuga) — Also Douglas spruce (*Pseudotsuga mucronata*) and Oregon pine.

Nomenclature (Sudworth).

Oregon pine (Cal., Wash., Ore.).
Red fir, yellow fir (Ore., Wash., Idaho, Utah, Mont., Colo.).
Red pine (Utah, Idaho, Colo.).
Douglas-tree, Cork-barked Douglas spruce. (Occasional.)
Spruce, fir (Mont.).
Puget Sound pine (Wash.).

One of the world's greatest trees. Form almost pure forests in Washington and Oregon. It is neither spruce, fir or pine, but as indicated by the generic name it is false hemlock. Grows rapidly.

Heartwood light red to yellow; scant sapwood nearly white; comparatively free from resin; pronounced variable rings (4 to 40 per inch).

Wood is variable, usually hard and strong; rather difficult to work, durable, splits easily, can be obtained in large pieces. Used for heavy construction, dimension timbers, lumber, railway ties, paving blocks, wood stave pipes, posts, poles, piles, masts and crossarms. The wood is used much as hard pine is used. For grading rules, see dense wood. Very resistant to treatment for which reason the Puncture Process has been developed.

"The term 'Douglas fir' is to cover the timber known likewise as yellow fir, red fir, western fir, Washington fir, Oregon or Puget Sound fir or pine, norwest and west coast fir." Standard Names for Structural Timbers, A. S. T. M.

dowel — (a) A wooden pin or peg usually cylindrical for joining together two timbers as distinguished from a tenon which is part of one of the pieces joined.

(b) A cylindrical or tapered plug set into a railroad tie to receive the spike. It is usually of hard wood bored for the spike and frequently is threaded so as to screw into a threaded hole in the tie. See also plug.

drained oils — See settled oils.

Drammen Standard — A Norwegian unit of lumber measure equivalent to a piece 2½ inches by 6½ inches by 9 feet or 12 3/16 feet B. M. One hundred and twenty Standards equal a Drammen Standard Hundred or 1,462½ feet B. M.

dressed and headed (D and H) — Flooring that is surfaced, tongued and grooved and is provided also with a tongue on one end and a groove on the other so that boards need not join over a joist. Also known as "side and end matched" which see.

dressed and matched (D and M) — Flooring that has been dressed, tongued and grooved.

dressed timber — Timber that has had one or more of its sides planed or surfaced after sawing. Commonly designated as S. 4. S.= surfaced 4 sides, S. 1. S. 1. E.= surfaced 1 side and 1 edge, etc.

drip sample — A sample obtained by a drip from a petcock during the transfer of a liquid from one container to another. Usually taken when emptying tank cars.

dry and wet — "These are only relative terms. The degree of dryness is of the greatest importance. The slight difference of a few per cent in the relative humidity is sufficient to stop the growth of certain fungi. The growth of the fungus depends more upon the relative humidity than upon the number of grains of water per cubic foot. It is also doubtless considerably influenced by the temperature. The effect of saturation of moisture is not limited to the air, but extends to the interior of the timber." F. J. Hoxie in "Dry Rot in Factory Timbers." See optimum moisture condition.

dry kiln — A structure or chamber in which lumber is dried by artificial heat.

dry oil — Dehydrated oil, oil containing no water or from which the water has been removed.

dry rot — The decay or rot in wood caused by the dry rot fungus (*Merulius lacrymans,* Hausschwamm). Incorrectly used to designate rot caused by other fungi that flourish in comparatively dry situations or in which the decayed wood is dry or punky. See *Merulius lacrymans.*

Dublin Standard.— See London Standard.

durability — The average time that timber may be expected to remain sound when exposed to conditions of service. The following estimates are based on experience and actual inspection by the Forest Products Laboratory on hardwood timbers. (Subject to early revision.)

LIFE OF UNTREATED WOOD PLACED SUBJECT TO DECAY.

Untreated Material	*Yrs.*
Lumber:	
Chestnut	12
White oak	8
Elm	7
Ash	5
Maple	4
Birch	4
Poplar	4
Cottonwood	4
Tupelo	4
Basswood	4
White heart beech	4
Red gum	4
Sycamore	3

Untreated Material	*Yrs.*
Posts:	
Locust	25
Mulberry	20
Osage orange	40
Catalpa	14
Chestnut	10
White oak	8
Red oak	5
Ash	5
Aspen	5
Gum	3

Untreated Material	*Yrs.*
Ties:	
Black locust	20
White oak	8
Chestnut	7
White heart beech	4
Birch	4
Maple	4
Red oak	4
Gum	3

duramen — See heartwood.

earlywood — See springwood.

edge — The narrower longitudinal face of a piece of timber.

edge grained — See comb grained, grain, quarter sawed.

elasticity — Elasticity is the property (possessed by most materials) of changing form with the application of force and recovering at once upon release from the force. In any elastic material the amount of compression or deformation is proportional to the force applied. Air and other gases under compression are elastic. The most commonly recognized elastic material is rubber. Timber is elastic within comparatively narrow limits.

elastic limit — The elastic limit (sometimes called proportional limit) is that point where the distortion ceases to be in proportion to the load. For example, if a beam deflects one-sixteenth of an inch with a 50 pound load it will deflect one-eighth of an inch with 100 pounds,

and so on, each additional load of 50 pounds causing an additional deflection of one-sixteenth of an inch until the "elastic limit" is reached, after which the deflections increase more rapidly than the increase in load. A timber stressed beyond the elastic limit will not resume its original form immediately upon the removal of the load. "Mechanical Properties of Woods Grown in the U. S.", Bul. 556, U. S. Dept. of Agriculture.

electrolysis — Chemical decomposition of a substance caused by the passage of an electric current through it. Frequently occurs in railroad spikes due to leakage in signal circuits, etc.

elm (Ulmus) — Five varieties of elm exist in the forests of the eastern U. S. There are no elms in the western U. S. or Canada of commercial importance. Wood heavy, hard, strong, very tough; moderately durable in contact with the soil, commonly cross-grained, difficult to split and shape, warps and checks considerably in drying, but stands well if properly handled. The broad sapwood whitish, heart brown, both with shades of gray and red; on split surface rough, texture variable coarse to fine. Elm is used in the construction of cars, wagons, etc., in boat and shipbuilding and for ties. The elms are medium to large sized trees, of fairly rapid growth, with stout trunk, form no forests of pure growth, but are found scattered in all the broad-leaved woods of our country, sometimes forming a considerable portion of the arborescent growth. (Slippery elm, rock elm, red elm.) Rock elm (*Ulmus racemosa*), (*Ulmus thomasi*), takes treatment with difficulty, other varieties readily. The elms are distinguished by wavy lines in the annual rings visible in the transverse section.

empty cell treatment — A treatment in which theoretically the cell walls of the wood in the treated portion remain coated with the preservative, the cells themselves being empty or only partly filled with preservative.

emulsion — Two or more substances insoluble in each other remaining in a homogeneous mixture with little tendency to separate into the constituent materials. It is frequently necessary (as in the Card Process) to keep the mixture agitated or to add a soluble, gummy substance to prevent separation. F. E. Dodge.

Encena (*Quercus agrifolia*) — California live oak. See live oak.

endogenous — An endogenous tree is one which grows by forming new cells throughout the already formed portion and not in a cambium layer. No annual rings are formed and the cross-section of the stem is dotted or porous instead of being ringed as in the exogens.

end-pile — To pile lumber or ties on end. This is a dangerous practice where the ends come in contact with the ground being likely to cause rapid decay. In lumbering end piling or endwise piling often means the direction in which the pieces of material are placed in respect to whether they are parallel to or at right angles to the direction of the alleys.

enzymes — Organic ferments. See ferments.

eremacausis — A theory prevailing about 1840 evolved by the chemist Justus von Liebig according to which the decay of wood was caused by a slow combustion or oxidation due to the action of air and moisture. Disproven by the researches of Pasteur. See phlogiston.

Eucalyptus — See gum.

evergreen oak (*Quercus agrifolia*) — California live oak. See live oak.

Exidia glandulosa — A common and widely distributed saprophytic fungus found on hardwoods, principally gum and beech. Similar to Thelephoraceæ but not of this family. One of the lowest forms of basidiomycetes. Fruiting body, a black jelly like mass spread over the surface and on the ends of ties often following the sapwood around in a ring. When moist it is slimy and much wrinkled, but when dry forms a thin, smooth, shiny membrane. The spores are white and are borne on the surface.

exogenous — An exogenous tree is one whose stem consists of bark, wood and pith and which grows by forming concentric layers of cells between the bark and the latest formed or youngest wood thus forming annual rings. The layer of newly formed or forming wood cells is called the cambium layer.

expansion coefficient — See coefficient of expansion.

expansion factor — See coefficient of expansion.

expansion joint — A space filled with plastic material which allows a certain amount of variation or change in its width to compensate for contraction or expansion due to change of temperature as in wood block paving.

expressed oils — See pressed oils.

exudation — The gradual oozing out of preservative from wood due either to rise of temperature with consequent expansion of included air or to external pressure. Most frequently encountered in heavily treated wooden cross arms and paving blocks in very warm weather.

face count — In dressed lumber, the measurement of the actual dimensions as distinguished from the measurement of the rough piece from which the lumber is manufactured. See strip count.

face side — face — In grading rough or S 2 S softwood boards, that side which shows the best quality, on S 1 S material, the dressed side. In grading most of the hardwoods, the poorer side. In general the wider longitudinal surface of a piece of timber.

Fahrenheit — A system of temperature measurement in common use in Great Britain and the United States. By this system the freezing point of water is called 32° and its boiling point 212°. One degree Fahrenheit is the equivalent of 1/180 of the difference between the temperatures of melting ice and boiling water.

Fahrenheit = 9/5 Centigrade + 32 = 9/4 Réaumur + 32.

fatty oils — Oils derived from animal and vegetable substances and consisting chiefly of compounds of organic acids.

feather-edge — A board that is thinner at one edge than at the other as a result of faulty sawing is said to have a feather-edge.

fencing — Rough softwood 1 inch lumber 4 inches or 6 inches wide.

ferments — Substances capable of producing chemical decomposition of an organic compound induced by living organisms or by enzymes.

Ferric Thiocynate Stain Test — Penetration stain test for sodium fluoride. See "Ferric Thiocynate Penetration Stain Test for Sodium Fluoride". Galen Wood, Proc. American Wood Preservers Ass'n, 1919, page 143.

fiber stress at elastic limit — The stress obtained in a timber by loading it to its elastic limit. It is the greatest stress the timber will take under a given loading and immediately return to its former position.

fibre — A slender, spindle-shaped, sharp-pointed wood cell usually with comparatively thick walls and narrow cavities. Fibres are the principal source of strength, hardness and toughness of woods.

fibre saturation point — In seasoning timber, the point at which all the free water contained in the cells has evaporated and the cell walls begin to dry. Moisture content in this condition is 20 per cent to 30 per cent of the oven dry weight.

fibrous — Fibrous woods are those having fibres of greater than ordinary length or woods where the fibres, which usually run parallel to each other, exhibit a decided interweaving which produces an irregularly grained wood very difficult to split. Such woods when broken across the grain do not give a clean abrupt break, but are apt to split up into numerous splinters. They will withstand great bending without fracture. Hickory and elm are typical examples. An extremely fibrous wood is that of the bamboo. See fibre.

field coat — A preliminary light treatment given to timbers to be stored or yarded before erection to prevent infection and minimize season checking.

figure-grained — See quarter sawed.

filtered oils — Oils from which solid matter has been removed by filtration.

filtered tar — Tar from which most of the free carbon has been removed by filtration.

final vacuum — Is a partial vacuum produced as the last operation in a pressure treatment for the purpose of withdrawing excess preservative and drying the timber.

fine-grained — Term applied to timber of slow growth, having narrow annual rings. Close-grained.

finishing — finish — The highest commercial grades of lumber. For details see various inspection and grading rules.

fir (Abies) — This name is frequently applied to wood and to trees which are not fir; most commonly to spruce, but also, especially in English markets, to pine. The Silver Fir (*Abies grandis*), the Red Fir (*Abies magnifica*), and the Noble Fir (*Abies nobilis*), are valued

west of the Rocky Mountains, while the Balsam Fir (*Abies balsamifera*) is of some commercial importance in the East. It resembles spruce but is easily distinguished from it, as well as from pine and larch, by the absence of resin ducts. Quality, uses and habits similar to spruce. There are five distinct varieties of fir commonly used in the United States. The timber known as Douglas fir is not a fir but is more like hemlock than anything else. The balsam fir of the northeastern United States is occasionally used for lumber of inferior grade. Not durable on exposure. Takes treatment fairly.

fire point — See burning point, fire test.

fire test — A test to determine the fire point or burning point of a liquid. The test is a continuation of the flash test in which the heating is continued and the test flame applied until the liquid ignites and continues to burn for at least 5 seconds. The temperature at which this occurs is known as the fire point or burning point. Used to determine the inflammability of liquids or the presence of inflammable materials in mixtures. See flash test.

firm red heart — Heartwood infected with *Trametes pini* but still firm enough to be serviceable as lower grades.

fish plate — See clamp.

fixed carbon — The organic matter of the residual coke obtained upon burning hydrocarbon products in a covered vessel in the absence of free oxygen. A. S. T. M.

fixture — (Line Construction) Any combination of two or more poles employed for jointly sustaining the same cross arms without such additional interbracing as would constitute a tower. A fixture, H fixture, H pole, etc.

flash point — flashing point — The minimum temperature to which a substance must be heated to give off inflammable gases in sufficient quantity to cause a distinct flash when a small flame or spark is brought in contact with them. See fire test.

flash test — A test to determine the flash point of a liquid. Wood preserving oils owing to their high flash point are usually tested by the open cup method. The standard Cleveland Open Cup Tester is minutely described in the Proceedings of the American Society for Testing Materials 1920. It consists of heating a small sample of the oil in an open cup or dish and passing a test flame above its surface. The temperature at which a distinct flash is obtained is the flash point. Care must be taken to conduct the test in a room free from drafts. See fire test.

flask, distilling — A glass receptacle with an opening of a diameter less than the greatest width of the flask, used as a container for liquids. Usually provided with a neck.

flask, side neck — A flask provided with a lateral tube communicating with the neck, through which the vapors pass and are condensed during distillation. This side tube usually has a slightly downward

slope to prevent the return of the condensed distillate to the flask. The body of the flask is usually spherical and the neck wide enough to accommodate a thermometer to indicate the temperature of the distilling vapors. See tentative standard, American Engineering Standards Committee, for Bituminous Materials.

flat grain — All lumber not classed as quarter sawed or comb grained. Bastard grain, slash grain, plain-sawed. See grain.

flexibility — That quality which renders a material capable of being bent without breaking. Thus, green timber is more flexible than dry.

flitch timber — A compound beam or timber made up of smaller pieces bolted or otherwise fastened together. Also applies to solid pieces of material which contain the bark on one or more sides which has not been edged off. See "Structural Details" by H. S. Jacoby.

float gauge — The commonest form of float gauge consists of a floating body provided with a flexible cord which passes over a pulley and terminates in an indicator. The float rests on the surface of the liquid in a tank or container and the indicator shows the depth of the liquid. In other forms the cord operates a graduated dial mechanism or the float is provided with a vertical graduated rod.

float test — A test to give a measure of consistency of the material. Originally a test to determine the approximate melting point of soft pitch. An aluminum float of standard size is used in the bottom of which is screwed a hollow brass plug filled with materials under examination. The apparatus is then floated on water, maintained at a designated temperature and the time required to soften, push out the plug of bitumen and allow water to enter the funnel in seconds is the float test.

fluidity — The relative ease with which a liquid flows. The opposite of viscosity.

fluoride — A combination of metal with hydrofluoric acid as sodium fluoride, magnesium silico-fluoride, aluminum silico-fluoride, calcium silico-fluoride, zinc fluoride, ammonium fluoride, used extensively as wood preservatives abroad and now being introduced in America. See Troschel, "Handbuch der Holzkonservierung," also "Die Holzkonservierung im Hochbaue" by B. Malenkovic, and "Die Bedeutung der Fluorverbindung en fuer die Holzkonservierung" by Dr. J. Netzsch.

flux — Bitumens, generally liquid, used in combination with harder bitumens for the purpose of softening the latter. A. S. T. M.

Fomes annosus (*Trametes radiciperda*) — Normally a parasitic root fungus, but also grows on structural timber in damp locations. Probably the most abundant, widely distributed and most serious of all fungi attacking coniferous timbers in mines. Family Polyporaceæ. Fruiting body flattened and shelving, often with large concentric grooves. Upper surface yellowish-brown to dark brown. Under surface light creamy. Medium sized, thin-walled pores.

Fomes applanatus (*Elfvingia megaloma*) — A fungus attacking cottonwood and other hardwood timbers. Family Polyporaceæ. Fruiting body white to brown, hard and woody. Under surface white, quickly turning brown when bruised.

Fomes pinicola — Attacks both living and dead coniferous timber. Family Polyporaceæ. Fruiting body, hoof-shaped or a flattened disc (applanate) often 2 feet or more in diameter. Frequently attacks coniferous structural timber. Upper surface reddish-brown to blackish, edge sometimes has resinous appearance, flesh creamy or pale yellow, under surface bearing the pores, white (yellow when bruised).

Fomes roseus — A saprophytic fungus common on spruce and hemlock timbers, severe in textile mills. Family Polyporaceæ. Fruiting body brackets on flattened discs, corky to woody and of uniform rosy color inside and outside.

forestry terms — See Bulletin 61, Bureau of Forestry, U. S. Dept. of Agriculture.

foundation timbers — Timbers used as the foundation or support of a structure.

fractional distillation — The separation of a mixture of liquids into its constituent parts by utilizing their boiling or distilling temperatures. The mixture is placed in a distilling flask or retort and the temperature is gradually raised. As the constituents boiling at or between various temperatures are vaporized, the vapors are condensed and collected separately. When the distillation is done on a laboratory scale as a test the fractions thus obtained are usually weighed and expressed as a percentage of the sample tested. A valuable test used to determine the nature of mixed oils and used as a basis for numerous other tests. The principal test upon which most specifications for oil preservatives are based.

fractionation — See fractional distillation.

frame timbers — Timbers forming the framework or support of a structure.

framing for buildings — Posts, mud sills, girders, framing joists. A. S. T. M.

free carbon — A mixture of complex hydrocarbons of a high molecular weight that exist as colloidal solutions or suspensions in the tar or tar oil and that are precipitated by diluting with a solvent such as benzol. Tars nearly always contain a portion of their free carbon in this colloidal state that cannot be removed by filtration. If not removed from tar oil wood preservatives by filtration it is filtered out by the wood itself, leaving a black slime on the surface. The presence of free carbon is readily detected by the blotter test.

free carbon in tars — Organic matter which is insoluble in carbon disulfide. A. S. T. M.

freezing test — A test to determine the amount of crystalline or solidified matter in an oil at a given temperature. The oil is cooled to the required temperature and rapidly filtered, the solid residue is dried

by absorption, pressing or centrifugation and the percentage determined by weighing. See method recommended by A. L. Dean and E. Bateman in Forest Service Circular No. 80 and J. M. Weiss, "Methods of Analysis of the Coal Tar Industry."

fruiting body — General name for mushrooms, toadstools, conchs, punks, perithecia and other specialized structures which bear the spores of fungi.

full butt treatment — Treatment of a pole or post from a point at or above the ground line to and including the butt end.

full cell treatment — A treatment in which the cells of the wood in the treated portion remain completely filled with the preservative.

full scale — Measurement of logs in which no reduction is made for defects.

fungicide — Any substance capable of destroying or killing fungi.

fungus — plural, **fungi** — A low form of plant life in which the plant is not divided into root, stem and leaves, but is of practically the same structure and composition throughout. They contain no chlorophyll (green coloring matter). They derive their substance from living or dead organic matter and reproduce usually by means of asexual (sexless) spores. The character of the under surface of fungi determines the family to which the particular fungus belongs The following table represents a broad and general classification.

Fungi which attack wood severely.

Conifers

Coniophora cerebella	*Merulius lacrymans*
Fomes annosus	*Polyporus Schweinitzii*
Fomes pinicola	*Polyporus sulphureus*
Fomes roseus	*Polystictus abietinus*
Lentinus lepideus	*Trametes pini*
Lenzites sepiaria	*Trametes serialis*

Hardwoods

Coniophora cerebella	*Lenzites trabea*
Dædalea quercina	*Merulius lacrymans*
Daldinia concentrica	*Pholiota adiposa*
Exidia glandulosa	*Polyporus sulphureus*
Fomes applanatus	*Polystictus pergamenus*
Glœoporus conchoides	*Polystictus versicolor*
Hydnum erinaceus	*Stereum fasciatum*
Hypoxylon coccineum	*Stereum frustulosum*
Hypoxylon cohaerens	*Stereum rameale*
Lenzites betulina	*Trametes sepium*

For descriptions see separate headings. See "Hausschwammforschungen," by A. Moeller; also "The Decay of Ties in Storage," by C. J. Humphrey, 1920 Proc. A. W. P. A.

fungus pit — A room, chamber or cellar, often partly or wholly below the surface of the ground and in which the temperature and humidity can be controlled. Used for growing fungi for experimental purposes. Fungus pits are often located in caves, abandoned mines or under green-house benches.

furring — A narrow strip of 1-inch lumber nailed to rafters, studding or joists as a backing for lath. Term also used to separate various layers of wood nailed solidly together.

gain — A notch, mortise or groove in a pole to receive the cross-arm.

gas tar, gas house tar, coal gas tar — Coal tar obtained as a by-product from the destructive distillation of bituminous coal in the manufacture of coal gas.

gas tar creosote — Creosote oil distilled from gas tar.

gas tar oils — Oils obtained by distillation from gas tar.

gauging — Measuring of contents of tanks, timber, etc.

gauging absorption — Determining the amount of preservative absorbed by timber during treatment by measuring the depth of preservative in the tank before and after treatment, the difference, after applying temperature correction factors, being the absorption. Weighing timber before and after treatment to gauge absorption in open tank treatments frequently leads to erroneous conclusions owing to the evaporation of moisture and the lighter oils.

Georgia pine (*Pinus palustris*) — See longleaf pine.

germicidal oils — Oils having properties rendering them toxic or poisonous to germs.

gin pole — A pole secured in a vertical position by guy ropes, provided with tackle for handling lumber.

Glæporus conchoides — A shelving form of polyporus with microscopic pores occurring on hardwoods. Family Polyporaceæ. The shelves are light buff and extend out ½ to ¾". When torn the pore surface separates from the cap like a thin sheet of rubber. Most common on oak and chestnut.

Grade 1 Creosote Oil — See American Railway Grade 1 Creosote Oil.

grading rules — Rules covering the inspection of timber published by various lumber or technical associations, railroads, etc. For various grading rules see "How Lumber is Graded," by H. S. Betts in Forest Service Circular 64. Also Trans. International Engineering Congress 1915. See also density rule, standard defects and rings per inch rule.

grain — The direction of the fibers, as straight or spiral grain. The direction in which lumber is cut, as edge or flat grain.

gravity — See specific gravity.

green oil — Anthracene oil, so called because of the green color that develops on the surface of the oil on standing, due to oxidation.

green timber — Freshly cut or unseasoned timber or any timber which contains free water in the wood cells. Any timber with a greater water content than air-dried timber.

gribble — See marine borers.

gross absorption — The total amount of preservative injected into or absorbed by timber during treatment. See initial absorption, net absorption, and kick back.

ground line — See optimum moisture condition.

ground line treatment — See partial butt treatment.

ground sill — A horizontal foundation timber which rests on the ground.

ground timbers — Timbers placed on or imbedded in the ground.

grouping — The custom of separating various woods of similar absorptive power into classes or groups to be treated together. See absorptive power.

guard rail — A metal or wooden rail laid parallel to the main rail of a railroad track to prevent cars from leaving the ties in case of a derailment. A fence or railing at the edge of an embankment, bridge or platform. See stringer.

gum (Liquidambar, Nyssa) — This general term refers to two kinds of wood usually distinguished as sweet or red gum, and sour, black or tupelo gum, the former being a relative of the witch-hazel, the latter belonging to the dogwood family.

Tupelo (*Nyssa sylvatica*) (sour gum, black gum): Maine to Michigan and southward to Florida and Texas. Wood heavy, hard, strong, tough, of fine texture, frequently crossgrained, of yellowish or grayish white color, hard to split and work, troublesome in seasoning, warps and checks considerably, and is not durable if exposed; used for inferior construction and ties and takes treatment readily. Medium to large sized trees, with straight clear trunks, locally quite abundant, but never forming forests of pure growth.

Tupelo gum (*Nyssa aquatica*) (cotton gum): Lower Mississippi basin, northward to Illinois and eastward to Virginia. Soft, light, not strong; close, compact grain; difficult to work. Takes treatment readily.

Sweet gum (*Liquidambar styraciflua*) (red gum, Liquidambar): Wood rather heavy, rather soft, quite stiff and strong, tough, commonly cross-grained, of fine texture, the broad sapwood whitish, the heartwood reddish-brown, the wood shrinks and warps considerably but does not check badly, stands well when fully seasoned and takes good polish. Sweet gum is used for ties and sometimes in construction. Takes treatment with difficulty. A large-sized tree, very abundant, often the principal tree in the swampy parts of the bottoms of the Lower Mississippi Valley; occurs from New York to Texas and from Indiana to Florida.

The term gum or blue gum is also used commonly for the Eucalyptus of the Gulf and Pacific coasts.

Wood of fine texture, frequently cross-grained, of yellowish or grayish white color, hard to split and work, warps and checks

considerably, and is not durable if exposed; used for inferior construction and ties and takes treatment readily. Medium to large sized trees, with straight clear trunks, locally quite abundant, but never forming forests of pure growth.

guy pole — See anchor pole.

hackmatack — See tamarack.

half dry — Seasoned by exposure to the atmosphere or otherwise not long enough to be air dry.

half-moon tie — A tie hewed or sawed on top and bottom only, but with bottom of markedly greater width than the top. (Known also as "half-round" tie). Also a tie hewed or sawed on bottom, top and sides, with the pith of the tree at or near the bottom of the tie, about midway between the two sides. (Known also as "halved" tie.) A. R. E. A.

halved tie — A tie hewed or sawed on top, bottom, and sides, with the pith of the tree at or near the bottom of the tie, about midway between the two sides. A. R. E. A.

hard pine — A term applied to all pines not classed as soft pine. Wood moderately light to heavy, resinous, harder and stronger than soft pines, annual rings very pronounced. The hard pines may be divided into four main divisions, longleaf pine (*Pinus palustris*), shortleaf pine (*Pinus echinata*), Cuban pine (*Pinus heterophylla*) and loblolly pine (*Pinus tæda*). The pond pine (*Pinus serotina*) is seldom distinguished at the mills where it furnishes much of the lumber known as North Carolina pine. (For descriptions see separate headings). The hard pines, particularly their sap woods, take treatment more readily than the soft pines. Their woods are so similar as to be very difficult to distinguish. Fortunately their strength, density and susceptibility to treatment depend more upon their density than their botanical species, so that the custom of grading them according to the Density Rule (see dense timber, Density Rule) is now becoming general. See pine. Southern yellow pine.

hardwood — A general classification of timber which includes all broad-leafed or deciduous woods as distinguished from needle-leafed or cone-bearing woods. In a more restricted sense, the harder and heavier timbers of the broad-leafed species, notably the oaks, ash, hickory, hard maple, etc.

hardwood creosote — Creosote oil distilled from hardwood tar.

Hartman Process — A combination treatment in which the protecting non-soluble oil preservative is applied first and the salt solution is caused to pass through this to the interior of the timber. The method is applicable either to pressure or open-tank treatments. A combination two movement treatment. Process not patented.

Hausschwamm — See *Merulius lacrymans,* dry rot.

headed — See dressed and headed.

heart-and-back tie — A tie with the pith of the tree at or near the side of the tie, about midway between the top and the bottom of the tie. (Known also as "wing" tie.) A. R. E. A.

heart penetration — Treatment in which the penetration extends throughout the sapwood and well into the heartwood. The extent to which this can be accomplished depends upon the timber, many species of which are practically impervious to treatment in the heartwood.

heart tie — A tie with sapwood no wider than one-fourth the width of the top of the tie between 20 in. and 40 in. from the middle of the tie. A. R. E. A.

heartwood — duramen — The region at the center of a tree which is dead and does not function in sap conduction. Often, but not always, distinguishable by its darker color which is generally due to chemical changes such as infiltration of the cell walls, and sometimes of the cell cavities with various materials, such as gums, resins and tannins. Heartwood takes treatment much less readily than sapwood, in some cases being almost impossible to penetrate even under high pressure.

heating tank — A tank used for heating preservatives provided with steam coils or arranged for a fire beneath it. A drum with removable head, used in shipping and heating preservatives or as a treating tank for fence-post butts, wood block or other small timbers.

heavy joists — In southern yellow pine timber, 2 inch stock, 14 inches wide and 2½ and 3 inch stock, 10 inches to 14 inches wide.

heavy oil — Distillates from coal tar heavier than water, particularly creosote and anthracene oils, to which the term is most frequently applied.

hemlock (Tsuga) — The hemlocks are represented by three American species, the principal one of which is Eastern hemlock (*Tsuga canadensis*). The wood is light to medium weight, soft, stiff but brittle, commonly cross-grained, rough and splintery, sapwood and heartwood not well defined; the wood of a light, reddish-gray color, free from resin ducts, moderately durable, shrinks and warps considerably, wears rough, retains nails firmly. Used principally for dimension stuff, timbers and ties. Takes treatment well. Hemlocks are medium to large sized trees, commonly scattered among broad-leaved trees and conifers, but often forming forests of almost pure growth.

"The term 'hemlock' is to cover southern or eastern hemlock; that is, hemlock from all states east of and including Minnesota." "The term 'western hemlock' is to cover hemlock from the Pacific coast." Standard Names for Structural Timbers, A. S. T. M.

hermetically — (a) So as to be air tight, as in closing and fastening the door of a treating cylinder. (b) To seal up pores of the wood with an impervious coating, as in waterproofing or in wood preservation relying on mechanical rather than antiseptic action for protection against attacks of fungi.

hickory (Hicoria or Carya) — There are eight species of hickory native to the United States of which five are of commercial importance as follows: Shellbark (*Hicoria laciniosa*), shagbark (*Hicoria ovata*), mockernut (*Hicoria alba*), bitternut (*Hicoria minima*), and pignut (*Hicoria glabra*). The wood is heavy, very hard and strong, tough, elastic and resilient, sap and heartwood of equal value in all respects if of equal density. Shrinks badly. It is not durable when exposed and is subject to attack by boring insects. Used to some extent for ties. The name walnut is applied to hickory locally in New York and Vermont. Takes treatment fairly.

high boiling oils — Oils with high boiling points or distilling only at high temperatures.

Hofman-Marcusson Test — See Marcusson's test.

hollow-horning — See internal checking.

honey-combing — See internal checking.

hot bath — Immersion of timber in an open tank of heated preservative.

humidity — Moisture or water vapor contained in the air. The amount of moisture that the air will hold depends upon the temperature and pressure. The higher the temperature and the lower the pressure, the more moisture the air will hold. Affects the durability of wood, especially in textile and paper mills. See relative humidity, also "Humidity in Relation to Moisture Inhibition by Wood and to Spore Germination on Wood," by S. M. Zeller, Annals of the Mo. Botanical Garden, February, 1920.

humus — A black or brown substance formed by the decay of vegetable matter. Vegetable mold.

Hydnaceæ — Fungi producing their spores on spines or teeth hanging from the under side of the fruiting body or on the outer exposed surface in the case of encrusting forms.

Hydnum erinaceus — A fungus attacking living and dead oak timber. Not very common but quite destructive and widely distributed. Family Hydnaceæ. Fruiting body white, under side a mass of hanging spines or fringe which bear the spores. One to twelve inches in diameter, often almost spherical.

hydrocarbons — Chemical compounds consisting solely of hydrogen and carbon in various proportions.

hydrometer — An instrument used for determining the specific gravity of liquids. It consists of a hollow float weighted so as to float vertically and provided with graduations to show the specific gravity of the liquid in which it is floating, the depth to which it is submerged depending upon the specific gravity of the liquid.

hygrometer — Any form of apparatus for measuring the humidity or moisture content of the air.

hygroscopic — Capable of absorbing or condensing moisture from the atmosphere. Many salts such as sodium hydroxide and zinc chlor-

ide possess this power in a marked degree. When exposed they will take up enough moisture to dissolve themselves. Kiln-dried wood will absorb a considerable amount of moisture from the air. See deliquescent, air dry, bone dry, kiln dry.

Hypha, plural **Hyphæ** — Branching cotton-like threads produced in the growth of fungi. Those hyphæ constituting the vegetative portion of the fungus, the part growing in the wood or other food supply, are known collectively as the mycelium.

Hypoxylon coccineum — Similar to Hypoxylon cohaerens but larger (¼" in diameter) and reddish brown often becoming blackened with age. Family Thelephoraceæ. This fungus like *Hypoxylon cohaerens* is confined to beech.

Hypoxylon cohaerens — A fungus attacking beech, where it is common and widely distributed, causing pocket rot. Family Xylariaceæ. Fruiting body in the form of small globular buttons not over 1/16" in diameter, black when mature and occurring in irregular patches.

Idaho white pine — " The variety of white pine from western Montana, northern Idaho, and eastern Washington." Standard Names for Structural Timbers, A. S. T. M. For description of wood see white pine.

ideal treatment — A treatment in which a preservative is injected in just sufficient quantity to be effective during the mechanical life of the timber.

idiosyncrasies — A term used in wood preservation to denote those peculiarities, flaws, variations or inequalities in the structure of wood which interfere with the uniform penetration and absorption of preservative liquids during treatment.

idler — A roller mounted in stationary bearings used in transferring long timbers. Sometimes placed at the end of a treating tank or between the hot and cold tanks in a two movement open tank installation.

ignition resistance — The relative reluctance of materials to take fire. The relative temperatures to which a material must be heated in air before burning begins. Proportional to temperatures of the fire or burning points.

ignition temperature — The lowest temperature at which a material will take fire.

ignition test — A test to determine the mineral or non-combustible matter contained in a preservative. Performed by igniting a small weighed sample in a porcelain crucible until all organic matter has been consumed and determining the percentage of ash remaining.

immersion treatment — See open-tank treatment.

impenetrable — See impervious, refractory.

impervious — Completely resisting the entrance or passage of liquids. Impenetrable.

impregnating — Causing a preservative to enter the wood. Commonly applied to pressure treatments as distinguished from non-pressure, absorption or surface treatments.

incision process — See Puncture Process.

increment borer — An auger with a hollow shaft used in removing a small core or pencil of wood from a timber for examination. Used in determining depth of penetration in treated timber and rate of growth in growing trees.

index of refraction — When a ray of monochromatic light passes from one medium into another as from air into a liquid, its direction is changed. The angle at which it strikes the surface is called the angle of incidence and that at which it leaves the surface on entering the second medium is called the angle of refraction. The ratio of the sines of these two angles is constant for any given medium and is known as the *index of refraction* for that medium. Index of refraction varies for each medium, depending upon the wave length of light that is used in making determinations, since monochromatic light must be used. Generally, the red hydrogen line C, the yellow sodium line D, and the blue hydrogen line F are the three wave lengths most frequently used. The difference between the refractive index for the C and F line is known as the dispersion. See Forest Service Circular 112 "The Analysis and Grading of Creosote."

The index of refraction of distillation fractions is sometimes included in the specifications for wood preserving oils to determine the presence of wood tar or mineral oils as adulterants in coal tar oil mixtures.

infection — The act of communicating a disease from one organism to another. The lodging and germinating of a fungus spore on timber.

inhibition point — The absence of air, the minimum or maximum temperature or moisture content beyond which a fungus ceases to grow or develop but remains dormant.

initial absorption — (a) Open tank: The amount of preservative absorbed by timbers during immersion and before the level of the preservative in the tank can be gauged or measured. (b) Pressure: The amount of preservative absorbed by a charge of timber while the retort or treating cylinder is being filled.

initial treatment — First treatment where the preservative treatment consists of more than one application as in reinforcing and supplementary treatments or the first movement where treatment consists of more than one movement as in two or three movement treatments. Field coat.

initial vacuum — Is so called when the reduction of pressure is the first step preceding the introduction of the preservative.

inner bark — See cambium layer. The inner layer of bark, next to the wood which forms a thin skin that, particularly in the conifers, is

hard to remove and which if allowed to remain prevents the injection of preservative.

inorganic salts — A term used to describe various metallic salts used as wood preservatives, as copper sulphate, fluorides, mercuric chloride or zinc chloride.

insulation — A material, usually a cover or coating, which prevents, resists or retards the passage of heat or electricity.

internal checking — Checking or cracking, usually along the medullary rays, in the interior of a piece of timber, due to the drying and shrinking of the interior wood after the piece has casehardened. Honey-combing, hollow-horning. See casehardening.

Iodine-Potassium Ferricyanide Stain Test — Penetration stain test for zinc chloride. See "Iodine-Potassium Ferricyanide — Starch Color Reaction Test for Determining Zinc Chloride Penetration." Galen Wood. Adopted as standard practice by American Wood Preservers' Assn. 1921.

jack pine (*Pinus divaricata*) — In European literature *Pinus banksiana*. Occasionally confused with lodgepole pine (*Pinus contorta*). Ranges from Western Maine to Minnesota and north into Canada. Superficially the wood of jack pine is similar to that of Norway and white pines. The sapwood white, the heartwood light brown to pale orange, sapwood constituting usually more than half the volume. Wood soft, light, not strong or tough, straight and rather coarse grained, easily worked, easily split and apt to warp and check in seasoning. More resinous than white pine but less so than Southern yellow pine. The heartwood is fairly durable in contact with the ground but the sapwood rots quickly. Used for railway ties, lumber, mine timbers, poles and fencing. Takes treatment well.

joists — Any of the parallel timbers set on edge, resting on foundations, beams or girders to support the planking of floors, decks, etc.

Juniper (Juniperus) — The western red cedar (*Juniperus scopulorum*) and the Southern red cedar (*Juniperus barbadensis*) yield woods that resemble those from the cedar (*Juniperus virginiana*). See cedar.

kick back — The amount of the preservative forced out of the cylinder when the pressure is released. "It varies greatly and results in erroneous measurements of absorptions as high as 40 per cent." Preservation of Structural Timber by Howard F. Weiss, 2nd Edition, page 118. "The most I have been able to get in the kick back was 14 per cent. The average per cent of kick back I have been able to get in a great many tests is 6.39 per cent. This was with a water and creosote solution. I do not think it would be very much different with straight creosote." F. J. Angier. See gross absorption, initial absorption, net absorption.

kiln — See dry kiln.

kiln dry — Seasoned in kilns or heated chambers to hasten the evaporation of moisture. Kiln dry timbers contain much less moisture than thoroughly air dry timbers and on exposure to the atmosphere will take up moisture and gradually assume an air dry condition. "Kiln-dried timber usually contains 5 to 10 per cent of moisture." R. S. Kellog — Lumber and Its Uses, p. 76.

knot — A deformation of the grain or fibre of wood at a point where a branch has grown. In coniferous woods knots are sometimes characterized by an accumulation of resin or pitch in the knot and the surrounding wood. Considered as a defect in timber. See "Standard Defects."

knot — encased — See Standard Defects.

knot — large — See Standard Defects.

knot — loose — See Standard Defects.

knot — pin — See Standard Defects.

knot — pith — See Standard Defects.

knot — rotten — See Standard Defects.

knot — round — See Standard Defects.

knot — sound — See Standard Defects.

knot — spike — See Standard Defects.

knot — standard — See Standard Defects.

Kyanizing — Kyan Process — Open-tank treatment, absorption treatment or steeping with approximately 1 per cent mercuric chloride solution. Process consists of an immersion in the solution for 24 hours for every inch of thickness of the timber plus 1. Original patent specified a 2.4 per cent solution. Patented in England by John H. Kyan in 1832. Very little used owing to poisonous nature of the preservative. Ties treated with this process were laid on the Baltimore & Ohio in 1838.

laminated timber — Is one made up of layers or laminations which may be nailed, bolted, screwed, glued or otherwise fastened together. See flitch timber.

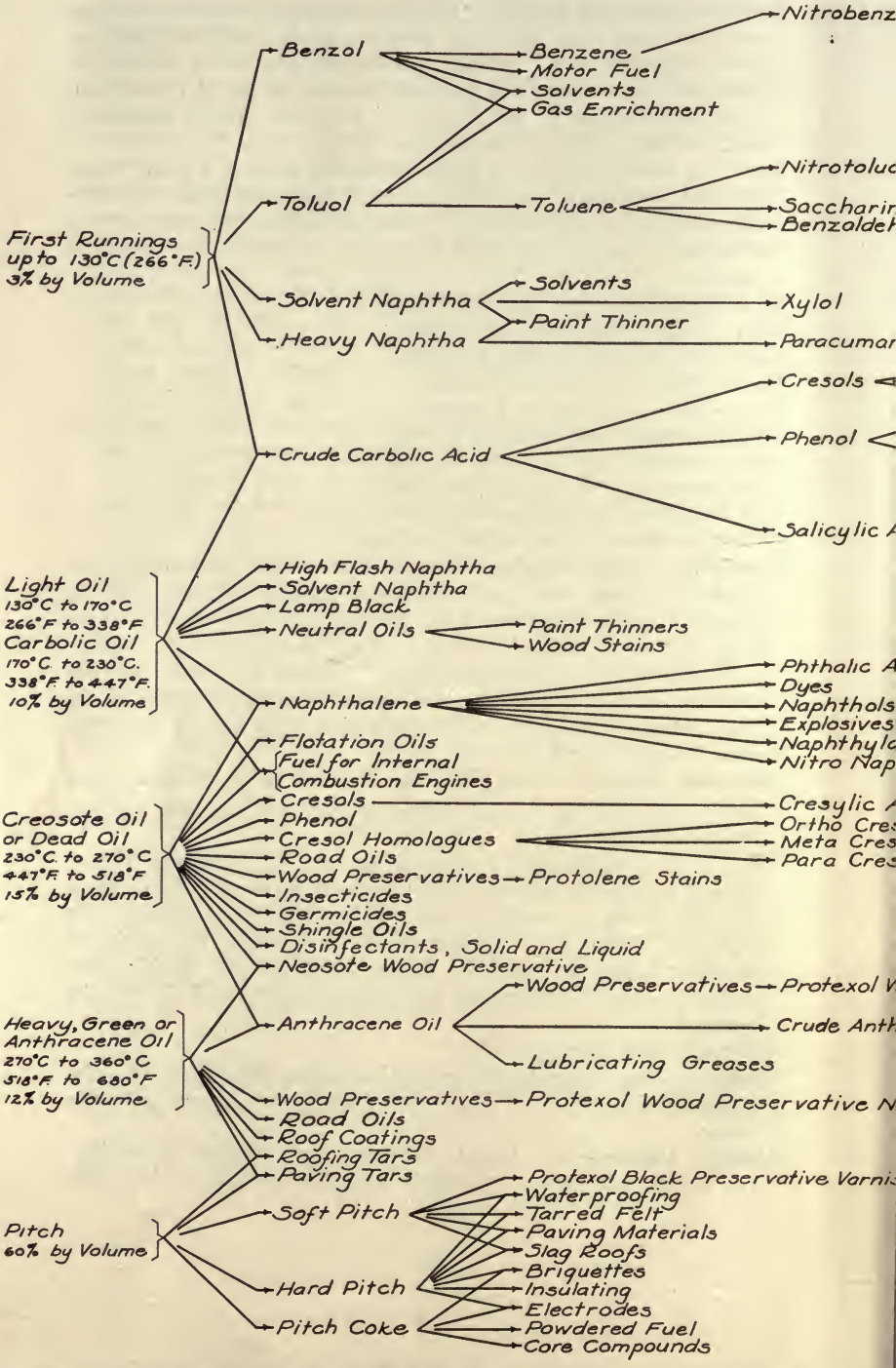
larch (*Larix occidentalis*) — Density or weight, moderately heavy; strength as a beam or post, strong; hardness, moderately hard; shock resisting ability, moderately good; stiffness, stiff; shrinkage, very moderate. "The term 'Western larch' is to cover the species of larch or tamarack from the Rocky Mountain and Pacific coast regions." Standard Names for Structural Timbers, A. S. T. M. See tamarack.

latewood — See summerwood.

leaching — The removal of preservative, particularly salts, by solution from timbers placed in contact with moisture, in wet soil or in water.

Lentinus lepideus — A saprophytic fungus very common on coniferous woods, particularly in contact with the ground, as ties, posts

COAL TAR
AVERAGE FRACTIONS AN



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Eighty per cent of the materials used in gas clouds and gas shells during the World War were carbon compounds which are or could be made from coal tar derivatives These include phosgene, mustard oil, mustard gas, tear gas, sneezing gas and various other poisonous and irritating substances

The above fractions are based on an average grade of coal tar. Variations in the grade of tar distilled as well as any variation from the above temperatures will cause variations in the quantity and quality of the products obtained

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and poles. Mycelium grows readily through the soil from one timber to another. Family Agaricaceæ. Fruiting body large, tough, white mushroom, stem and upper side of cap covered with brownish scales. Gills white and frequently toothed or serrated on the exposed edges.

Lenzites betulina — A very common and very destructive saprophyte attacking both heart and sapwood of hardwood lumber particularly birch. Family Agaricaceæ. Fruiting body a corky and flexible shelf 1 to 3″ wide, in overlapping clusters. Upper surface light brown and velvety, often marked with concentric bands of yellow or orange. Gills coarse and white or light buff.

Lenzites sepiaria — A very common saprophytic fungus attacking coniferous woods everywhere. Causes serious injury to roof timbers, ties and wharf planking. Family Agaricaceæ but placed by some in Polyporaceæ. Fruiting body brown, densely hairy, small and flexible. Gills brownish.

Lenzites trabea — A saprophytic fungus very similar to *Lenzites sepiaria* but occurring in hardwoods. Family Agaricaceæ. Color somewhat lighter than *Lenzites sepiaria* and cap smooth instead of hairy. Gills closer and frequently join to form elongated pores.

life — See durability, also mechanical life.

light oil — Lowest boiling distillates from coal tar. So called because lighter than water, having a specific gravity less than 1.00.

limits of practice — In actual performance of any process or operation, the maximum allowable variation from a theoretically perfect standard.

Limnoria — See marine borers.

linden — See basswood.

liquid at — This term followed by a temperature signifies that a material contains no crystallized or solidified matter at that temperature. It is tested by heating a sample of the material in a suitable container to a temperature about 10° higher than that designated. It is then allowed to cool until the required temperature is reached, when it is stirred with a glass rod which is immediately removed and examined. If liquid at the desired temperature the rod should show no solid particles clinging to it on removal from the sample. Used in determining the suitability of preservatives for application, particularly by the open tank and brush methods.

live oak — The hardest and most durable of all the oaks. The principal varieties are live oak (*Quercus virginiana*), California live oak (*Quercus agrifolia*); live oak (*Quercus chrysolepis*). The name is due to the fact that the leaves are evergreen. Used in construction and ship building. Wood very compact, medullary rays prominent, annual rings hardly distinguishable. Takes treatment with great difficulty.

loader — See tie loader.

loblolly pine (*Pinus tæda*) — Nomenclature (Sudworth):

old field pine	shortleaf pine	foxtail pine
torch pine	bull pine	Indian pine
rosemary pine	Virginia pine	spruce pine
slash pine	sap pine	bastard pine
longshot pine	meadow pine	yellow pine
longshucks	cornstalk pine (Va.)	swamp pine
black slash pine	North Carolina pine	longstraw pine
frankincense pine	black pine	

Large-sized tree, forms extensive forests, wider-ringed, coarser, with more sapwood than the longleaf pine, but the two often confounded. This is the common lumber pine from Virginia to South Carolina and is found extensively in Arkansas, Texas and Southern states. Also commercially sold as shortleaf. Used frequently in place of better grades where strength is not essential. Not durable untreated. Takes treatment readily. For general description, see pine, hard pine, Southern yellow pine, rings per inch rule, density rule.

localized pressure treatment — See butt pressure process.

lodgepole pine (*Pinus contorta* Dougl.) (*Pinus murrayana* Balf.) Also called tamarack pine, black pine, Murray pine, prickly spruce, black spruce and white spruce. An important timber tree of the Rocky Mountains and Canada. Not so strong as Douglas fir. It is practically as strong as Western yellow pine and stronger than Engelmann spruce and Alpine fir. Straight grained, fairly soft and easily worked. Used for ties, mine timber, poles, posts and lumber. Not durable in contact with the soil but takes treatment easily.

logging terms — See Bulletin 61, Bureau of Forestry, U. S. Dept. of Agriculture.

London oils — Creosote oils produced by gas works in the London district to distinguish them from country oils.

London Standard — A European lumber unit equal to 27 feet B. M., equivalent to a piece 9 in. by 3 in. by 12 ft. One hundred and twenty London Standards equal a London Standard hundred equal to 3,240 feet B. M.— Dublin Standard.

longitudinal section — Any section of timber whether radial or tangential that is cut parallel to the grain or pith of the wood.

longleaf pine (*Pinus palustris*)

Nomenclature: Southern pine, pitch pine, heart pine, Florida pine, Georgia pine, Texas yellow pine, rosemary pine, turpentine pine.

Hard, heavy, tough, elastic, durable and resinous; the strongest and stiffest of the pines.

Wood quite uniform, generally narrow annual rings (often 20 to 25 per inch), dense, wide sapwood in young trees, heartwood much darker than the sapwood, very free from defects. Used in all kinds of constructions, ship building, cars, docks, poles, piling, ties, flooring, etc. Heartwood very resistant to impregnation, sapwood readily treated. See hard pine, pine, Southern yellow pine.

low pressure process — A preservative process employing artificial pressure only slightly above atmospheric as distinguished from pressure processes employing pressure from 100 to 200 pounds per square inch and non-pressure processes employing no artificial pressure.

Lowry Process — An empty cell pressure process employing creosote and consisting of the following steps or movements:

(a) Creosote heated to 180 to 200° F. is injected to a specified amount in excess of the specified final absorption.

(b) A quick vacuum is applied to remove the excess oil.

Final absorption 6 to 10 pounds per cubic foot. Patented by C. B. Lowry in U. S. A. in 1906.

machined ties — Ties that have been adzed at the rail seat, bored for spikes or screws and with ends squared and cut to length. This machining is now done in adzing machines, through which the ties are passed under automatic tools on a continuous conveyor. See adzing.

Maintenance of Way Creosote — See American Railway Grade 1 Creosote Oil.

maintenance treatments —A coined term used to describe a treatment given subsequent to the original or initial treatment. Usually after the lapse of sufficient time to allow season checking to progress to its full extent. Sometimes given to replace preservative which by volatilization or leaching may have disappeared from the wood. Sometimes called supplementary, reinforcing or secondary treatments.

maple (Acer) — There are nine species of maple found in the United States, of which four species are of commercial importance from the lumber standpoint. These are hard or sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), soft or silver maple (*Acer saccharinum*), and Oregon maple (*Acer macrophyllum*). Hard maple is by far the most abundant and useful member of the group. Wood heavy, hard, strong, stiff and tough, of fine texture, frequently wavy-grained, this giving rise to "curly" and "blister" figures. Not durable in the ground or otherwise exposed. Maple is creamy white, with shades of light brown in the heart; shrinks moderately, seasons, works and stands well, wears smoothly and takes a fine polish. The wood is used for ceiling, flooring and finishing lumber in house, ship and car construction; it is used for the keels of boats and ships and for ties. Takes treatment readily but penetration is erratic. The maples are medium-sized trees of fairly rapid growth; sometimes form forests and frequently constitute a large proportion of the arborescent growth.

Marcusson's test — A method of determining the water content of tar or coal tar oils by adding water saturated solvents to the oil and distilling. The reason for using the solvents is due to the fact that they form binary binding mixtures with the water and these mixtures boil at temperatures below the boiling point of water. In this manner, the tar or coal tar oil does not have to be heated to so high a

temperature and there is no liability of explosive generation of steam, for instance, if benzol is used, the mixture boils at about 64 and toluene-water boils at about 80 and xylol-water boils at about 92° C. The water distils first and can be measured, then the solvent and finally the oil. The solvent prevents the frothing and spattering which occurs in the distilling apparatus when water is present. The test is simple and accurate. Originally known as the Hofman-Marcusson Test.

marine animalculæ — Marine borers, which see.

marine borers — Any of the small marine animals which make their homes in passages or borings which they excavate in timbers submerged in sea water. The principal species are the following: Teredo, Xylotria and Nausitoria. These are mollusks that bore passages in timber submerged in sea water. The boring is done by means of the shell which is small and attached to the anterior end of the body. The burrow is extended as the animal grows and is lined with a shell-like calcarious excretion. The wood is usually attacked by the borers in great numbers so that it becomes honeycombed by the burrows and is easily broken and worn away. The length of the mature animals varies from a few inches in some species to six feet in others. They develop more rapidly in warm waters. In America they attack piling, wharves, etc., on the Atlantic, Pacific and Gulf coasts.

Pholas — A marine stone boring bivalve resembling a long clam that sometimes attacks wood.

Limnoria, Chelura (gribble wood louse) — Small crustaceans about 1/8 inch in length which bore into and destroy submerged wood. They honeycomb the wood to a depth of about 1/4 inch. This wood then scales off or decays and the animals then begin a new attack. This progresses at the rate of about 1/2 inch a year depending upon the activity of the borer. They burrow with their mandibles or jaws which are chisel-like at the ends and the burrows extend from slightly above to slightly below tide marks. Common throughout the Atlantic and Pacific coasts.

Sphæroma — A species of marine borer quite similar to but less common than Limnoria. Active along the Atlantic, Pacific and Gulf coasts.

For further information see Moll "Die Bohrmuschel." See also "The Marine Borers of San Francisco Bay and the Biological Factors Governing Their Occurrence" by Chas. A. Kofoid in 1921 Proc. of American Wood Preservers Assn. and "American Shipworms" by Paul Bartsch, 1922 Proc. A. W. P. A.

mastic — A sticky, gummy adhesive. A term used to designate a material sometimes used as a cushion for wood block pavements.

matched — See tongued and grooved.

mechanical abrasion — The destruction or wearing away of the outer portions of timbers due to blows or rubbing as in railroad ties under

the rail seat, or from the blows of tamping bars, or the wear on a floor or pavement due to traffic.

mechanical life — The ultimate life of timber as it is limited by mechanical abrasion.

mechanical properties — The properties of wood which enable it to resist deformations, loads, shocks, or forces. Thus the ability to resist shearing forces is a mechanical property of timber. See strength. (Mechanical Properties of Woods Grown in the U. S.— Bul. 556, U. S. Dept. of Agriculture.)

medulla — See pith.

medullary ray — Vertical bands or plates of wood cells formed radially in wood and appearing as radial lines in cross section and as short vertical lines or dashes in tangential sections. In radial or quarter sawed sections they appear as bands or strips of varying width very noticeable in the oaks. Also known as pith rays.

merchantable — Following is quoted from 1918 Interstate Rules for the Classification and Inspection of Yellow Pine Lumber. Inspection: "All sizes under nine inches shall show some heart entire length on one side; sizes 9 inches and over shall show some heart the entire length on 2 opposite sides. Wane may be allowed ⅛ of the width of the piece measured across face of wane, and extending ¼ of the length of the piece on one corner or its equivalent on two or more corners; provided that not over 10 per cent of the pieces of any one size shall show such wane."

See Interstate Rules of 1916 and amendments of March, 1918, which contain a density requirement.

mercuric chloride — A compound of mercury (quick silver) with hydrochloric (muriatic) acid. Bichloride of mercury. Corrosive sublimate. Used in Kyanizing.

Merulius lacrymans — Dry rot fungus, Hausschwamm,— the weeping merulius. One of the large group of fungi known as the Polyporaceæ which bear spores in pores or pits. The following description is taken from "The Mushroom Book" by N. L. Marshall: "The food-seeking portion consists of fine white threads, mycelium, which penetrate the woodwork of buildings, causing it to crumble to dust. The fruiting portion consists of flat, irregular bodies whose under surface bears the spores in shallow pits separated by narrow ridges. Water is excreted from these flat disks, which habit of dropping like tears, has suggested the specific name lacrymans, from the Latin *lacrymare* — to weep." While the fungus is common and widely distributed in Europe, authentic specimens are uncommon in America. Several closely related species, however, are quite common and where *Merulius lacrymans* is reported in America it is usually one of these that is referred to. "According to the latest work *M. lacrymans* is not common in the U. S. We have a number of closely related species which are rather common." C. J. Humphreys. See "Die Zersetzungserscheinungen des Holzes" by Robert Hartig, also "Der Hausschwamm" by Carl Mez. See *Coniophora cerebella.*

micro-organism — An organism, either animal or vegetable, so small as to be invisible or indistinguishable except with the aid of a lens or microscope as a fungus spore, a bacterium or a microbe.

mill construction — Mill or slow-burning construction is a system of building construction designed to reduce the fire risk. It consists largely in massing timbers to avoid corners and ignitable projections, the installation of fireproof or fire retardent partitions, the enclosing of stairways and the protection of ceilings with fire retardent material.

mineral matter — ash — See ignition test.

mineral oils — See petroleum oils.

mixed oils — Obtained by distillation from mixed coal tar and water gas tar. Many gas plants manufacture both coal gas and water gas and run all the tar into a common receiver thus producing a mixed tar.

mixture — A combination of two or more liquids unaccompanied by any chemical change or change in volume.

modulus of elasticity — Coefficient of elasticity — A mathematical term expressing relation between the amount of extension or compression of a material and the load producing that extension or compression (Kent). It is equal to:

$$\frac{\text{Load in pounds} \times \text{length of the part extended in inches.}}{\text{Sectional area in square inches} \times \text{amount of extension in inches.}}$$

Numerically, the modulus of elasticity of a material is the force in pounds required to stretch a sample of that material with a cross-sectional area of 1 square inch to double its length, on the assumption that the fibers would not be stressed beyond their elastic limit. India rubber has a very low modulus of elasticity, while that of steel is very high. It is, then, the measure of the stiffness or rigidity of a substance.

modulus of rupture — A mathematical term expressing the relation between the load required to break a bar supported at the ends and weighted at the center and the dimensions of the bar. It is equal to:

$$\frac{3 \times \text{breaking load in pounds} \times \text{length in inches.}}{2 \times \text{breadth in inches} \times \text{square of the depth in inches.}}$$

The above definition and formula refer only to bars or beams of rectangular cross section. Modulus of rupture is the computed fiber stress in the outermost fibers of a beam at the maximum load and is a measure of the ability of a beam to support a slowly applied load for a very short time. It is a universally accepted term, and the values are quite comparable for various species and sizes of timber. It is a definite quantity, and the personal factor does not enter to any great extent into obtaining it. See "Mechanical Properties of Woods Grown in the U. S."— Bul. 556, U. S. Dept. of Agriculture.

mold — mould — Any of the lower fungi (not basidiomycetes) growing on materials in damp situations, especially applied to such

growths as form wooly or furry coatings on decaying vegetable matter. While molds probably cause little disintegration of wood fibers they cause considerable damage to wood by causing discolorations and indicate conditions favorable to the growth and development of wood destroying fungi.

molding — moulding — In a state of being attacked by mold or having mold growing upon it. Most frequent between timbers piled in contact with each other particularly when damp or green.

mortise — mortice — A cavity, hole, notch or groove in a timber designed to receive a correspondingly shaped tenon of another timber to form a joint.

mother liquid — mother liquor — A term occasionally applied to crude coal tar when added to creosote or distillate oils to increase the specific gravity and viscosity as in creosote coal tar solutions.

mud sill — The bed piece or bottom timber of a dam. A short piece placed as a bearing beneath the main sills of the bents of a trestle.

mushrooms — The fruiting bodies of the higher fungi, mainly agarics and morels, which are considered edible. Those agarics considered poisonous are popularly termed "toadstools".

mycelium — A netlike mass of filaments or threads (hyphæ) which constitute the vegetative portion of a fungus. That portion which extends within the body of the wood. The spawn.

nailing strips — See screeds.

naphthalene — $C_{10}H_8$ commonly known as tar camphor, contained in large quantities in creosote oil. White crystalline scales melting at 79° C. and boiling at 218° C. Very volatile, even the solid form at ordinary temperatures volatilizing slowly and giving off its characteristic odor. Evaporates from treated wood in a relatively short time after exposure. Appears on the surface of creosoted timber in the form of shining scales.

natural vacuum treatment — An open tank treatment in which the absorption and penetration of the preservative are obtained by utilizing the vacuum formed in the wood as a result of cooling after a hot bath due to the contraction of the air in the wood cells.

Nausitoria — See marine borers.

neck rot — Decay confined to a few inches at the ground line of posts or poles, causing a reduction of cross section at this point.

net absorption — The amount of preservative remaining in the timber after treatment. See gross absorption, initial absorption, kick back.

nitrogenous — Containing nitrogen.

nitro phenols — Combinations of tar acids with nitrogen, highly toxic, also used in combinations with fluorides as wood preservatives. Usually sold under various trade names. See Troschel "Handbuch der Holzkonservierung," also "Hausschwamm Forschungen Heft 6" and Wehmer "Wirkung einiger Gifte auf das Wachstum des echten Hausschwamms."

non drying oil — A non drying oil does not of itself possess to a perceptible degree the power to take up oxygen from the air and lose its liquid characteristics. (A. S. T. M.)

non-germicidal oils — Oils that are not toxic or poisonous to germs as crude oils, petroleum oils.

non-pressure processes — Treatments in which the preservative is applied to the wood without the aid of mechanical pressure. Brush, spray or open tank treatments which see.

non-volatile oils — Oils that do not vaporize or evaporate at atmospheric or relatively low temperatures. High boiling oils.

North Caroline pine — Pine lumber cut in the coast region of Virginia, North and South Carolina. See pine, hard pine, shortleaf pine.

Norway pine (*Pinus resinosa*) — Nomenclature: Red pine, hard pine, Canadian red pine.

Heartwood light red and thin, sapwood yellow to white. Light, hard, elactic and resinous but not durable.

Used for piling, poles and flooring. Takes treatment well. See pine. For further details see Dept. of Agriculture Bulletin 139 "Norway Pine in the Lake States."

"The term 'Norway pine' is to cover what is known also as 'red pine.'" Standard Names for Structural Timbers, A. S. T. M.

oak (Quercus) — There are 50 species of oak native to the United States and Canada. Wood very variable, usually very heavy and hard, very strong and tough, porous, and of coarse texture; the sapwood whitish, the heart oak brown to reddish brown. It shrinks and checks badly, giving trouble in seasoning, but stands well, is durable, and little subject to attack by insects.

Oak is used for many purposes; in ship building, for heavy construction, car and wagon work, for piles and wharves, railway ties, etc., and even white oak is now customarily treated to protect the larger amount of sapwood.

The oaks are medium to large sized trees forming the predominant part of a large portion of our broad-leaved forests, so that these are generally oak forests though they always contain a considerable proportion of other kinds of trees. Three well-marked kinds, white, red and live oak are distinguished and kept separate in the market. Of the two principal kinds white oak is somewhat stronger, tougher, less porous and more durable. Red oak is usually of coarser texture, more porous, often brittle, less durable and generally more troublesome in seasoning than white oak.

In carpentry and furniture work, red oak brings about the same price at present as white oak. The red oaks everywhere accompany the white oaks, and like the latter are usually represented by several species in any given locality. Live oak, once largely employed in ship building, possesses all the good qualities (except that of size) of white oak, even to a greater degree. It is one of the heaviest, hardest

and most durable building timbers of this country; in structure it resembles the red oak; but is much less porous. See live oak, red oak, white oak.

oil gas tar — Tar obtained from petroleum or shale oils in the manufacture of oil gas (Pintsch Gas). Some oil tar also is produced by the destructive distillation of crude petroleum in the manufacture of of oil gas. In tars from this source the quantity of paraffin hydrocarbons present is generally much greater than in that produced in the manufacture of carburetted water gas.

oil seasoned — Seasoned or dried by immersion in oil heated above the boiling point of water thus causing vaporization and ejection of moisture from the timber. If properly carried out this does not reduce the strength of timber as steaming does. See Paper XXIII4, International Association Testing Materials, 6th Congress, New York, 1912. See also boiling process.

oil tester — An apparatus for testing the flash and fire points (inflammability) of liquids. It consists essentially of a jacketed cup provided with a burner for heating the sample and a suspended thermometer to determine the temperature during the test. See Cleveland Open Cup Tester, flash test.

olive-black mold — A fungus that produces a bluish-black discoloration quite similar to blue stain which see.

open cup tester — See Cleveland Open Cup Tester.

open grained — Having the annual rings relatively wide, indicating rapid growth. Less than 6 rings per radial inch is considered open grained wood.

open tank process — Consists of an immersion of the timber in a bath of heated preservative or in succeeding baths of hot and cold preservatives. Briefly stated, the theory of the process is as follows: As the timber is immersed in a bath of preservative heated to a temperature above the boiling point of water, the air in the wood cells expands and the sap or moisture contained in the wood evaporates in proportion to the duration of the hot bath and also the temperature of same. The timber is then plunged into cold oil, which causes the air remaining in the wood to contract, forming a partial vacuum. To satisfy this vacuum the oil is drawn deeply into the wood. We know that air occupies as high as 60 per cent of the bulk of seasoned wood. According to the familiar law of physics, air expands 1/273 its volume for every degree C. that it is heated. Consequently when we heat the timber in the preservative from about 20 degrees C. to slightly above 100 degrees C., the air in the wood expands about ⅓ in volume and, in forcing its way out of the wood, expels much of the moisture from the cell walls. This air rises to the surface of the hot preservative in the form of small bubbles, and the moisture leaves the oil in the form of vapor. As a matter of fact a vacuum is also created by removing the timbers from the hot bath, the expanded

air in the wood structure being contracted by contact with the colder air of the atmosphere and the oil then drawn deeper into the wood.

The principle of the open tank process first stated by Henry Youle Hinds, M. A., F. R. G. S. in 1863. Professor Seely first used this principle commercially in 1868.

open tank treatment — Consists of immersing the timber to be treated in a bath of hot or cold preservative or succeeding hot and cold baths. The duration of the bath or baths being regulated in accordance with the desired protection. The temperature of the hot bath should be regulated in accordance with the green or dry condition of the timber or the kind of treatment desired, whether full or empty cell. For dry timber the temperature is usually held about 30 to 40 degrees F. below the boiling point of water while for green timber or empty cell treatments from 10 to 20 degrees F. above 212 degrees. The temperature of the cold bath is usually held near the atmospheric temperature. For heavy treatments successive baths in hot and cold preservatives are employed or at the completion of the hot bath the heat is shut off and the timber left in this bath until the preservative cools off to atmospheric temperature.

optimum moisture condition — A condition that insures sufficient moisture at all times for the rapid growth and development of fungi best illustrated by the decay of poles at the ground line and also in staves of wooden water tanks. It is not the alternately wet and dry condition that proves unfavorable but the balance of water and air, thus in the alternation of wet and dry conditions one gets at some point intermediate between the wet and dry ranges at which decay is at its maximum.

outage — See ullage.

out of face — A term used to designate a method of installing ties in track, i. e. all the ties laid in a given length of track installed or renewed at the same time. Howard George.

oven dry — Wood from which the moisture has been practically entirely removed by artificial means. "In oven-dry or bone-dry wood the moisture content is less than 1 per cent of the absolutely dry weight of the wood." R. S. Kellogg — "Lumber and Its Uses," p. 76. See also "Mechanical Properties of Woods Grown in the United States," Bul. 556, U. S. Dept. of Agriculture.

oxidation — A process by which a substance combines chemically with oxygen. The commonest example probably is the rusting of iron.

oxygen line treatment — A special form of partial butt treatment extending down to a point where there is not sufficient air to support fungus life. Dependent upon the porosity and moisture content of the soil. In clay, the oxygen line is close to the surface, in humus lower, while in dry sand it may be below the pole butt.

painting — The liberal application of a liquid preservative to the surface of timber by means of a brush.

paraffin — A colorless, crystalline substance derived from petroleum by distillation. It is not toxic or antiseptic and when used as a preservative serves merely to prevent fungus growth mechanically by filling up the pores or cells of the wood. It is insoluble in water and consequently of value as a waterproofing agent.

parasitic fungi — Fungi that grow on and obtain nourishment from living organisms.

partial butt treatment — ground line treatment — Treatment of a pole or post from a point at or above the ground line to a point below the ground line but not including the butt end. See oxygen line treatment.

pathology — The science treating of the nature, causes, progress, results and control of disease. In its broadest sense includes timber preservation and refers to the diseases of timber, fungus attack, rot, decay.

paving pitch — A pitch with a melting point of 135 to 145° F.

pecky — peggy — peck — A term applied to certain kinds of lumber, chiefly cypress, that is full of small pockets of decay in the heartwood. It is the result of the attack of a fungus in the living tree and does not develop after the tree is cut. Its presence is said to prevent the attack of other fungi thus acting as a preservative.

penetrance — See penetration.

penetration — The depth to which the preservative enters the wood through its lateral surface (lateral penetration, radial penetration) and end or transverse surfaces (end penetration, longitudinal penetration). A visible measure only. For visual method for determining the penetration of inorganic salts in treated wood see E. Bateman — Forest Service. Circular 190.

See Ferric Thiocynate Stain Test and Iodine-Potassium Ferricyanide Stain Test.

perforating process — See Puncture Process.

permeating — The action of the preservative in passing into the pores and through the cell walls of wood.

petroleum oils — mineral oils — Petroleum or oils obtained by distillation from petroleum.

phenanthrene — $C_{14}H_{10}$ Isomeric with anthracene and found together with anthracene in coal tar. When pure it crystallizes in colorless scales with a faint blue fluorescence. Melting point 99 deg. C., boiling point 320–322 deg. C. When present in excess it acts like anthracene to form sediment in coal tar oils at ordinary temperatures and appears on treated surfaces in the form of shining scales. See "Preservation des Bois" by E. Henry.

phenoids — See phenols.

phenol coefficient — A measure of the toxicity of a material as compared to that of pure phenol. Ordinarily used in connection with disinfectants. Occasionally used in specifications for preservatives.

phenols — Organic compounds of carbon, hydrogen and oxygen found in various tars. They are intermediate in character between acids and true alcohols but more closely resemble the latter. The phenols most plentiful in coal tar are phenol (carbolic acid, phenic acid, phenyl alcohol, hydroxybenzene) and cresol (cresylic acid, methyl-hydroxybenzene). Traces of others are also found. They are very toxic but are quite volatile, consequently their value as wood preservatives is not permanent. Commonly called tar acids. "The higher boiling the tar acid the greater is the toxicity in the same concentration." Dr. L. F. Shackell in "Surface Tension of Wood Preserving Oils as Factors in Protection Against Marine Borers."

phlogiston — The old phlogiston hypothesis of decay, as taught in the older chemistry text books, has long since been exploded. This hypothesis assumed a purely chemical action of certain gaseous constituents of the air upon the wood, thus causing it to disintegrate. While fungi were long known to be associated with the rotten wood in many instances, they were considered as a secondary feature developing on the wood as a result of its disintegration. See also eremacausis.

Pholas — See marine borers.

Pholiota adiposa — A saprophytic fungus occurring occasionally on both hardwood and coniferous ties and lumber, also occasionally as a wound parasite on living trees. Very common on fallen trunks and stumps in the woods. Family Agaricaceæ. Fruiting body a yellow, mushroom, cap and stem covered with brown scales. Sticky when moist, stems frequently curved and usually thickened at the base. Grows singly or in clusters. Gills yellow, spores rusty brown.

photomicrograph — A photograph of the magnified image of a microscopic object.

physical properties — Those properties of wood which have to do with its structure, such as density, cell arrangements, fibre length, etc. In its broad sense the term physical properties includes all those properties listed as mechanical properties as well as those pertaining to its structure.

pickling — A term formerly applied to chemical treatments of any sort, in England more particularly to creosoting.

pile — spile — A round timber driven into the ground with the large end or butt uppermost. Used as a foundation for wharves, docks and other marine structures, on land in the foundations of buildings, as a supporting framework for trestles and bridges and wherever the soil is of a nature unsuitable for the support of concrete or masonry foundations.

piling — Timbers used for piles.

pine (Pinus) — There are 39 species of pine found in the United States. Very variable, very light and soft in soft pine, such as white pine; of medium weight to heavy and quite hard in hard pine, of

which longleaf or Georgia pine is the extreme form. Usually it is stiff, quite strong, of even texture, and more or less resinous. The sapwood is yellowish white; the heartwood, orange brown. Pine shrinks moderately, seasons rapidly and without much injury; it works easily, is never too hard to nail (unlike oak or hickory); it is mostly quite durable, and if well seasoned is not subject to the attacks of boring insects. The heavier the wood, the darker, stronger, and harder it is, and the more it shrinks and checks.

Pine is used more extensively than any other kind of wood. It is the principal wood in common carpentry, as well as in all heavy construction, bridges, trestles, etc. It is also used in almost every other wood industry, for spars, masts, planks and timbers in ship building, in car and wagon construction, for railway ties and water pipes.

Pines are usually large trees with few branches, the straight, cylindrical, useful stem forming by far the greatest part of the tree; they occur gregariously, forming vast forests, a fact which greatly facilitates their exploitation.

Of the many special terms applied to the pine as lumber, denoting sometimes differences in quality, the following deserve attention: white pine, pumpkin pine, soft pine, in the Eastern markets refer to the wood of the white pine (*Pinus strobus*), and on the Pacific Coast to that of the sugar pine (*Pinus lambertiana*). Yellow pine is applied in the trade to all the Southern lumber pines; in the Northeast it is also applied to the pitch pine (*P. rigida*); in the West it refers mostly to bull pine (*P. ponderosa*). Yellow longleaf pine, Georgia pine chiefly used in advertisement, refers to the longleaf pine (*P. palustris*). Hard pine is a common term in carpentry and applies to everything except white pine. Pitch pine includes all Southern pines and also the true pitch pine (*P. rigida*) but is mostly applied, especially in foreign markets to the wood of the longleaf pine (*P. palustris*). For the great variety of confusing local names applied to the Southern pines in their homes, part of which have been adopted in the markets of the Atlantic seaboard, see report of Chief of Division of Forestry for 1891, page 212, etc. See hard pine, soft pine and under various local names.

pine tar creosote — Creosote oil distilled from pine tar. See creosote.

pin oak (*Quercus palustris*) — Spanish oak, water oak, swamp oak. Characterized by small branches which cause numerous pin knots throughout the wood. See red oak.

pitch — (a) The residue remaining in the stills after the distillation of coal tar, wood tar, turpentine and certain oils.

(b) The resinous sap exuding from coniferous trees — resin.

(c) Solid residues produced in the evaporation or distillation of bitumens, the term being usually applied to residues obtained from tars. A. S. T. M.

(d) The inclination or slope of a roof or floor. Pitch is expressed as a fraction obtained by dividing the height or rise by the span, as degrees or as inches of rise per foot of span.

pitch pocket — See Standard Defects.

pitch streak — See Standard Defects.

pith — The cylinder of soft, spongy tissue forming the centre of the trunk and branches of exogenous plants. The medulla.

pith ray — See medullary ray.

plain-sawed — See flat grain.

plank — A piece of lumber 2 inches to 3 inches thick.

plate — A horizontal timber placed on a wall or on uprights to carry the trusses or rafters of a roof. The sill of a partition or frame.

plug — A small square or cylindrical piece of treated wood to be driven into a hole in treated timber that has been bored into for testing or inspection. Sometimes used to close holes where knots have been removed from treated timber. Square treated plugs are used to fill in old spike holes.

pole — (Line Construction). A single column employed for sustaining at a desired distance above the earth structures (cross arms, brackets, pins, etc.) supporting insulators and conductors attached thereto.

pole borer — A term applied to several insects chiefly beetles more properly the species (*Parandra brunnea*) which in the larval stage cause injury by boring into poles usually near the ground. Also occasionally applied to other borers such as white ants or termites and wood peckers which attack poles. See Damage to Poles by T. E. Snyder in U. S. Dept. of Agriculture, Bureau of Entomology Bulletin 94, Part 1 and Circular 134.

pole tie — A tie made from a tree of such diameter that not more than one tie can be made from a cross-section. (Known also as "round" tie; and may be "rifle" or "target" tie, "slabbed" tie, or "half-round" or "half-moon" tie.) A. R. E. A.

polymerization — A chemical process by which a chemical compound is changed into one having the same percentage composition but a greater number of atoms in its molecule, hence having a greater specific gravity.

Polyporaceæ — Fungi producing their spores in vertical tubes, the ends of which appear as pores or perforations on the under side of the fruiting body or on the outer surface of encrusting forms.

Polyporus Schweinitzii — A parasitic fungus attacking the roots and basal trunk of coniferous trees. Continues to grow after the timber is cut particularly in moist situations such as wharf piling and in mines. Family Polyporaceæ. Fruiting body fleshy and very juicy and attached to the trunk in the form of brackets, one above the other. Sometimes when growing from roots or timber they are circular and may have a short central stalk. Upper surface brown

and velvety, flesh yellowish to brown and spongy, under surface olive. Pores large and irregular.

Polyporus sulphureus — A large fungus attacking both coniferous and hard woods. Frequently found on ties and poles. Family Polyporaceæ. Fruiting body usually a series of very irregular overlapping shelves, often very close together to form a large round mass a foot or more in diameter. Bright orange yellow fading to sulphur yellow with age. When young, soft and fleshy and exuding a clear yellow juice when squeezed. Later hardens and becomes brittle and firm. Under surface bright yellow.

Polystictus abietinus — A fungus attacking the sapwood of all conifers and sometimes the heartwood of spruces, firs and hemlocks. Not common on structural timbers but plentiful on stored logs, in lumber yards and mines, also found on railroad ties and occasionally on structural timbers. Family Polyporaceæ. Fruiting body small, white, leathery and densely hairy above. Violet below with medium sized pores which often split up into teeth later.

Polystictus pergamenus — A fungus attacking all species of hard woods, often found on fire killed trunks. Attacks structural timbers much as *P. versicolor* does. Family Polyporaceæ. Fruiting body, small leathery brackets appearing in masses, overlapping and frequently joined laterally to form long shelves. Color grayish above, lavender or purplish below.

Polystictus versicolor — A fungus attacking all species of hardwoods, very common and very destructive. Found wherever hardwood timber comes in contact with the soil as in posts, poles, ties, mine timbers, etc. Family Polyporaceæ. Fruiting body small, tough, leathery discs or brackets, frequently closely overlapping, upper surface soft and hairy with bands of various shades from white to brown. Lower side white. Pores very minute.

pontoon — (a) A boat or barge used as the support for the roadway of a floating bridge. (b) A low flat bottomed barge equipped with a derrick, a lighter. (c) A tight cylinder, box or reservoir used in raising sunken vessels, as the gate of a dry dock or as the support for a floating dry dock.

poplar (Populus) — Sudworth credits twelve species of the genus Populus to the United States. Poplar is classed with whitewood, tulip tree (*Liriodendron tulipifera*), cottonwood (*Populus deltoides*) and basswood (*Tilia americana*). These trees are not botanically related but all furnish similar soft fine woods and the names are commercially interchangeable. Wood light, very soft, not strong, of fine texture and whitish, grayish to yellowish color, usually with a satiny luster. The wood shrinks moderately, checks little, some cross-grained forms warp excessively, is easily worked, but is not durable. Used as building lumber to some extent and takes treatment very easily.

pores — Pores are relatively large hollow cells or tubes seen in the cross sections of wood, due to the presence of vessels or water carrying tubes. See vessel. Arrangement of pores frequently serves as a means of identification.

post oak (*Quercus minor*) — Heavy, hard and strong; checks badly in drying; durable in contact with the soil. See white oak.

powder post — The work of the larvæ of several small beetles chiefly of the genus Lyctus. These live in the sapwood of dry, seasoned hardwood timber and reduce the interior of the wood to a fine dry powder. See "A Revision of the Powder-Post Beetles of the Family Lyctidæ of the United States and Europe" by E. J. Kraus with an Appendix by A. D. Hopkins, Ph.D. Technical Series, No. 20, Part III, Bureau of Entomology, U. S. Dept. of Agriculture.

Powell Process — Powellizing — An open tank process employing a saccharine solution containing arsenic and probably other chemicals. The exact composition of the preservative is kept secret. Process consists of immersing timber in the cold solution gradually raising the temperature to the boiling point and held at this temperature for a few hours (time depending upon the timber to be treated) after which it is allowed to cool. Treated timbers are then removed to a drying chamber and dried at a temperature rising gradually from 130° F. to 170° F. Used primarily in Australia. See "Notes on the Antiseptic Treatment of Timber in India" by R. S. Pearson, Indian Forest Records, Vol. III, Part 2.

premature decay — Decay induced through the presence of conditions exceptionally favorable to the growth and development of fungi.

pressed oils — expressed oils — Oils obtained by pressing the sludge from filters, settling tanks or centrifugal machines or by passing unfiltered oil through filter presses.

pressure pump — A hydraulic pump used to force the preservative into the wood in a pressure cylinder.

pressure tank — An air tight tank containing preservative to be used in a treating cylinder. The pressure to be applied is obtained by compressing the air above this oil using this instead of pumps to force the preservative into the cylinder and to maintain the pressure during treatment.

pressure treatment — A treatment in which the preservative is forced into the wood under pressure.

prime — A grade of timber described as follows in the 1918 Interstate Rules for the Classification and Inspection of Yellow Pine Lumber. Planks 7 inches and under wide shall show one heart face; over 7 inches wide shall show ⅔ heart on both sides, all free from round or through shakes, large or unsound knots. Scantling shall show three corners heart, free from through or round shakes or unsound knots." See Interstate Rules of 1916 and amendments of March 1918 which contain a density requirement.

proprietary preservative — A patented, labeled or branded preservative, one which certain companies or individuals have the exclusive right to manufacture or sell under such label or brand.

pump log — A pipe or conduit made by boring a longitudinal hole through a timber. Pump log conduit is usually made from square timbers and provided with a raised ring or collar at one end which fits into an enlargement of the bore in the abutting section.

Puncture Process — A method of securing penetration in naturally resistant timber, particularly Douglas fir, by the aid of incisions, punctures, perforations or slits in the lateral surfaces of the timber from which the wood can be penetrated longitudinally. First used in Austria but developed commercially in the United States. See paper by Edmund M. Blake, Proc. A. W. P. A. 1920. See also page 370 of Troschel: Hand buch der Holzkonservierung.

punk — See fruiting body.

putrefaction — The process of putrefying, the decomposition of animal and vegetable substances attended by the evolution of fetid gases. It is the result of the activity of organism of the simplest form — the Schizomycetes. It can therefore take place only when the conditions are favorable for the life and growth of these organisms. A temperature of from 60 to 80° F., a moderate degree of humidity and limited access of air are the conditions most favorable to putrefaction.

pyknometer — A small accurately calibrated glass bottle with a perforated glass stopper used for the measurement of exact quantities of liquids in determining their specific gravities.

pyrometer — An instrument for measuring degrees of heat higher than the range of the mercuric thermometer. A high temperature thermometer.

quarter sawed — Timber so cut that one of its faces passes approximately through or includes the center or pith of the wood, i.e., one of its faces is a radial section. The angle which the annual rings make with the surface is specified with some woods, while with the hardwoods it is usually specified that a certain per cent of the surface must show flakes which may be large or small.

quartered tie — A tie hewed or sawed on top, bottom and sides, with the pith of the tree at or near a corner of the tie. A. R. E. A.

radial section — A section of timber cut longitudinally or in the direction of the grain and passing through the center or pith of the wood.

rafter — A beam supporting a roof and to which the roof covering or its immediate framework is fastened.

rail fastening — A device for fastening rails to railroad ties, usually in the form of a driven spike or a screw where wooden ties are used.

Railway Grade 1 Creosote — See American Railway Grade 1 Creosote Oil.

rail wear — The wearing or grinding away of a railroad tie beneath the rail, caused by the movement of the rail in expanding and contracting. Term also used to denote the measure or depth of such wear.

reagents — Any chemical substance used to determine the nature or composition of another chemical substance by means of their mutual chemical behavior.

Réaumur — A thermometer scale in which the freezing point of water is marked zero and its boiling point 80 deg. One degree Réaumur is 1/80 of the difference in temperature of melting ice and boiling water. Réaumur = 4/9 (Fahrenheit — 32) = 4/5 Centigrade.

rectangular tie — A tie hewed or sawed on top, bottom and sides. (Known also as "pole" tie, "squared" tie, and "squared-pole" tie; and may be "rifle" or "target" tie, "half-moon" or "halved" tie, "heart-and-back" or "wing" tie, "boxed-heart" tie, or "quartered" tie.) A. R. E. A.

red cedar (*Juniperus virginiana*), (*Juniperus scopulorum*), (*Juniperus barbadensis*) — Light, soft, weak and brittle; easily worked and durable. See cedar.

red gum — *Liquidambar styraciflua* — See gum.

red heart — See Standard Defects.

red oak (black oak) — The coarser, more durable and more porous of the oaks including the true red oak (*Quercus rubra*), pin oak (*Quercus palustris*), Spanish oak (*Quercus digitata*), yellow or black oak (*Quercus velutina*). Wood is ring porous with large open pores, coarse grained, well marked annual rings, medullary rays few but broad and prominent. It is heavy, hard and strong, checks badly in seasoning and is not durable in contact with the soil. Used for ties, construction, clapboards, etc. Takes treatment well, particularly longitudinally.

redwood (Sequoia) — There are two species, the common redwood (*Sequoia sempervirens*) and mammoth redwood (*Sequoia washingtoniana*). The big trees of California. Light and soft; brittle and strong; not resinous and very durable. It is used for fence posts, railway ties, water-pipes, flumes and shingles. It is the principal construction wood of California. Takes treatment easily. "Redwood to include the California wood usually known by that name." Standard Names for Structural Timbers, A. S. T. M.

refined tar — Tar from which the water and more or less of the lighter oils have been removed by evaporation or distillation until the residue is of the desired consistency. A dehydrated low carbon tar.

refractory — Offering resistance to the entrance of preservatives. Used in connection with timber which takes treatment poorly.

refusal treatment — See saturation.

re-inforcing treatment — See supplementary treatments.

reject — See cull.

relative humidity — The amount of moisture contained in the air expressed as a percentage of the maximum amount that the air could hold at the same temperature and pressure measured by means of the hygrometer.

renewals — Ties or timbers used to replace those that have failed from decay or wear. Replacements not caused by accidents.

residue — The undistilled portion of an oil or other material, remaining in the retort or flask at the end of a fractional distillation. In the case of tar oils, consisting usually of a mixture of high boiling oils known as pitch.

resiliency — resilience — The power to return or spring back to the original shape after being distorted. Elasticity.

resin — The substance which exudes from wounds in certain coniferous trees and from which turpentine and resin are obtained by distillation. They exude also from hardwoods under certain conditions as in the case of red gum and Philippine *Dipterocarps*. Resins are usually insoluble in water but soluble in alcohol, ether or volatile oils. Crude turpentine — pitch.

resin duct — "Resin ducts are long, narrow channels surrounded by cells and filled with resin. Unlike vessels they have no walls of their own but are limited by a layer of cells called epithelium." S. J. Record — "Economic Woods of the United States." Resin ducts are found only in certain coniferous or resinous woods, though in the Philippine Islands they are found in certain hardwoods as in red gum and *Dipterocarps*.

resinous — Containing or producing resin. Term "resinous wood" is synonymous with conifer, softwood. "It is believed that resin cannot be relied upon as an indication of the durability of lumber although present in amounts as high as 13–15 per cent., for it is seldom equally distributed in the wood." S. M. Zeller, Annals of Missouri Botanical Garden, February 1920.

retort — (a) An approximately spherical or pear shaped vessel of glass, metal or porcelain, provided with a condenser tube extending laterally from the upper portion. Used in the distillation of compounds or mixtures. As the more volatile portions of the mixture or compound are vaporized the vapors pass out through the lateral tube where they are condensed and collected.

(b) A cylindrical metal tank or tube, one or both ends of which are closed by a tight door, used to hold ties or timber during preservative treatment under vacuum or pressure. A treating cylinder.

retort car — See cars.

ring porous — Ring-porous woods are those in which the larger vessels or pores (often visible with the naked eye) are localized in the inner or first formed portion of the annual ring, the remainder of the ring being made up of smaller vessels or fibres. The appearance of the cross section of such woods is that of a series of concentric porous rings separated by denser, more solid wood. Oak, chestnut and ash are good examples.

ring rot — Decay which follows the annual rings more or less closely.

rings — See annual ring.

rings per inch rule — A grading rule formerly used in segregating the 3 general commercial classes of hard pines by which the number of growth rings per inch as measured in an average of 5 inches across the face of the stick is used to distinguish these pines, as follows:

15 or more rings per inch — longleaf pine.
8 rings to 15 rings per inch — shortleaf pine.
Less than 8 rings per inch — loblolly pine.

The forerunner of the Density Rule. Suggested by Dr. Herman von Schrenck, Proceedings A. R. E. & M. of W. Association, 1909. See also Proceedings A. S. T. M. for 1909.

roof — The top or upper end of a post or pole usually wedge shaped, conical or cut at an angle to prevent the collection and absorption of water.

rosin — Residue remaining in the still after the volatile oils have been driven off, in the distillation of crude turpentine (resin).

rot — See decay.

rotting pit — See fungus pit.

Rueping Process — An empty cell pressure process employing creosote consisting of the following steps or movements:

(a) Compressed air 1 hour or more.

(b) Treating cylinder filled with oil without reducing pressure.

(c) Pressure increased to 150 pounds and held till specified absorption is obtained.

(d) Pressure released, cylinder drained and vacuum applied. "a" is sometimes omitted and air pressure applied after "c." If green timber is treated it is first subjected to live steam or boiling to remove moisture. Final absorption 4 to 6 pounds per cubic foot. Patented in U. S. A. by Max Rueping 1902 and 1911.

rupture — See modulus of rupture.

S 4 S — See dressed timber.

S-hook — An "S" shaped band of metal usually tapered from one edge to the other, driven into the end of a piece of timber to prevent splitting and checking or to prevent the spreading of checks already started.

S-iron — See S-hook.

St. Petersburg Standard — A European lumber unit based on a piece 1½ inches by 11 inches by 12 feet equal to 16½ feet B. M. One hundred and twenty Standards are known as a St. Petersburg Standard Hundred, equal to 1,980 feet B. M. 165 cubic feet.

salting — The practice of putting salt between the outer and inner planking of the hull of a ship to prevent decay of the timbers. It is customary in salting ships to place the salt between the planking and

the ceiling. The practice of salting, however, is not necessarily limited to that procedure. See "Rules for the Construction, Inspection and Characterization of Sail and Steam Vessels" by E. P. Dohr, published in 1876.

salt solutions — Solutions of metallic or mineral salts in water, used as preservatives. Those most commonly used are zinc chloride, sodium fluoride, bichloride and copper sulphate, which see.

salt treatment — Preservative treatment in which the preservative used is a mineral or metallic salt in solution in water. Salts commonly used for this purpose are zinc chloride, fluorides, silicates, mercuric chloride, copper sulphate, which see.

sample thief — See thief and barrel thief.

sap penetration — Penetrance of the preservative throughout the sapwood with little or no penetration of the heartwood.

saprophytic fungi — saprophytes — Fungi that grow on dead organic matter.

sap stain — The effect of the action of certain fungi which discolor the sapwood. It does not appreciably affect the strength or working qualities of the wood. See blue stain, olive-black mold.

sap tie — A tie with sapwood wider than one-fourth the width of the top of the tie between 20 in. and 40 in. from the middle of the tie. A. R. E. A.

sapwood — alburnum — The outer or younger portion of the trunk or branch of an exogenous tree which carries the sap. This wood is usually porous, the canals are open and it is less resistant to decay than the heartwood. Sapwood on the average is as strong as heartwood especially when of equal density and moisture content. In over mature trees during the period in which the wood is put on very slowly it is liable to be light in weight and hence weaker than the average material for the tree.

saturated — Wood impregnated so thoroughly that it will absorb no more.

saturation — Treatment to refusal or until the wood is completely penetrated by a full cell treatment. A desirable treatment but economically impracticable. Occasionally obtained under exceptional conditions. The term is sometimes applied to full cell pressure treatments regardless of absorption or penetration.

saw kerf — That portion of a timber that is converted into sawdust in sawing.

scantling — All sizes of lumber exceeding 1½ inches and under 6 inches in thickness and from 2 inches to under 6 inches in width.

Schizomycetes — See bacteria.

scoot — An inferior grade of hardwood lumber.

screeds — sleepers — nailing strips — Timbers, usually 2 inches by 2 inches to 4 inches by 4 inches, to which flooring is nailed. Frequently set in concrete flush with the surface in which case they are usually beveled on one or both edges.

season checking — See checking, shrinking.

seasoning — The removal of the natural moisture present in timber when cut. Usually accomplished by exposing the cut timber to the atmosphere and allowing the moisture to evaporate. The process may be hastened by placing the timber in heated chambers or immersing in heated oil. See green timber, air dry, half dry, kiln dry, steaming, air and oil seasoned.

seasoning yard — See storage yard.

secondary treatment — Any treatment subsequent to the first or initial treatment, maintenance treatment, reinforcing treatment.

sediment — Solids of any kind contained in oils usually crystals or free carbon. In treating tanks, dirt, sawdust, etc., that collect from the timber immersed in the oil.

Seeley Process — First used commercially in America in 1868. A non-pressure creosote treatment by which timber is heated in a closed cylinder of creosote oil and the temperature raised from 212 deg. to 300 deg. F. This heated oil was suddenly replaced by cold oil which caused a contraction of air and condensation of vapors in the wood and resulted in the absorption of the cold preservative. Patented by Chas. A. Seeley in 1867.

seeping — The passage of liquid preservative from treated timber into surrounding soil or other timber in contact. Caused by gravity and capillary action.

segregation — See grouping.

separating strip — A strip of wood or metal placed between timbers during treatment to insure contact of the preservative with the entire surface of the timbers. Lath are commonly used for this purpose.

settled oils — Oils from which the solids have been removed by allowing them to stand in tanks. The solids sink to the bottom and the settled oils are drained off from the top.

shake — ring — See Standard Defects.

shakes — See Standard Defects. See also clapboard, shingle.

shake — through — See Standard Defects.

shallow treatment — A treatment in which the penetration is slight.

shear — The name of the stress which tends to keep two adjoining planes or surfaces of a body from sliding, one on the other, under the influence of two equal and parallel forces acting in opposite directions. A force which produces shear (or shearing stress) in a material is called a shearing force. See "Mechanical Properties of Wood Grown in the U. S."— Bul. 556, U. S. Dept. of Agriculture.

sheathing — Tongue and grooved boards when used as a covering on the sides of a structure when only one thickness is used. Rough boards used as a covering on the sides of a structure as a backing or foundation for shingles or siding.

sheet piling — Thick plank driven as piling as in the wall of a coffer dam, the face of a wharf or pier or as a retaining wall.

shim — A thin plate of wood used to separate timbers or elevate them to grade or to take up mechanical wear as between the rail and cross tie. A tie plate. See separating strip.

shingle — A thin oblong piece of wood with one end thicker than the other to lap longitudinally in covering roofs and walls of buildings. Usually sold in bundles of 250 shingles 4 inches wide or the equivalent in random widths. Cypress shingles are usually 18 inches long and 7/16 inch thick at the butt, while those of other woods are 16 inches long by approximately 5/16 inch thick at the butt. "Shakes."

ship lap — Term applied to boards and planking having the edges rabbeted so that when in position the edge of each plank makes a flush joint with the one adjoining.

shipping dry — Lumbermen consider this wood with a moisture content of 30 per cent. See air dry.

ship timbers — Ship timbers, ship decking. A. S. T. M.

ship worm — See marine borers.

shortleaf pine (*Pinus echinata*).

Nomenclature: Common yellow pine, hard pine, spruce pine, bull pine, pitch pine, Virginia yellow pine, North Carolina pine, Carolina pine, slash pine, old field pine.

Wood quite variable and irregular, annual rings wide near the heart, usually hard, tough, strong, durable and resinous, lightest of the hard pines. Uses similar to longleaf pine. Takes treatment readily. See hard pine, pine, also rings per inch rule. Dense timber.

shot holes — Holes made in timber by boring insects.

shrinkage — Shrinkage along the length of timber is very small. Shrinkage in directions at right angles to the grain is very much greater and varies from 2 or 3 per cent to about 20 per cent. Radial shrinkage is about three-fifths as great as tangential shrinkage.

shrinkage, radial — The measure of the change in width of a quarter-sawed or edge-grain board.

shrinkage, tangential — The measure of the change in width of a flat sawed board. (Bul. 556, U. S. Dept. of Agriculture.)

shrinking — The reduction of the dimension of timber which occurs as a result of the loss of moisture in drying or seasoning. Too rapid, unequal or non-uniform shrinking cause season checking and warping.

side and end matched — End matching used to give tighter joints and keep faces of pieces even. Known also as "dressed and headed," which see.

signal trunking — Wooden boxing or conduit for the protection of cables. Sometimes buried in the ground, sometimes resting on the ground, or on short posts close to the ground.

silico-fluoride — See fluoride.

sill — A horizontal timber which forms the lowest member of a frame or on which a structure rests.

slab — The outer portion of a log which is removed and rejected in sawing lumber.

slab tie — A tie made from the first or outside cut of a log. A. R. E. A.

slash grain — See flat grain.

sleeper — A railroad tie. See also screed.

sling — A loop of rope, cable or chain, used to bind together a charge of timber to facilitate handling in open tank treatments or to facilitate unloading of ties or timbers from cars or ships. Also charge of timber bound with a sling.

sludge — See sediment.

snow fence — A fence or wind break, usually made of planking, built parallel to a railroad to prevent drifting of snow on the track.

snow shed — A shed built over a railroad track to prevent snow from falling on the track. Frequently found in regions of heavy snow fall or in mountainous regions where there is danger of snow slides.

sobby — See wet rot.

soda dip — Treatment of lumber at the mill by immersing it in a solution of bicarbonate or carbonate of soda to prevent sap stain.

sodium fluoride — See fluoride.

sodium silicate — A sodium salt of silicic acid made by melting together silicon dioxide (quartz sand) and sodium carbonate. It is soluble in water and when the solution dries it leaves a transparent film on a surface coated with it. It is known commercially as water glass and is used in making artificial stone, waterproofing and fireproofing. In wood preservation it has been used to fill the cells of the wood making it waterproof and fireproof and mechanically preventing the development of fungi. It is not toxic in any sense nor antiseptic and makes the wood very hard, brittle and difficult to work.

soft and plastic — An old requirement in specifications for wood preserving oils to indicate the consistency of the residue remaining after distillation. In modern practice superceded by the float test which see.

soft pine — White pine (*Pinus strobus*), sugar pine (*Pinus lambertiana*) also several minor species of similar characteristics. Wood light, very soft, not resinous, of even texture, shrinks, swells and warps less than the hard pines. Used as structural timber, and for tanks and wood stave pipe. Quite durable on exposure. Takes treatment with difficulty.

softwood — A general classification of timber which includes all needle leafed or cone bearing species as distinguished from the broad leafed woods, frequently also the softer and lighter species of the broad leafed woods such as poplar, soft maple, gum and catalpa.

solubility — Ability to be dissolved or taken into solution.

solution — A liquid combination of a liquid and a non-liquid substance or of two liquids, accompanied by a reduction in volume but not

by a chemical change. Frequently but incorrectly applied to mixtures of liquids. See mixture.

solution oil — See creosote coal tar solution.

solvent — A liquid capable of dissolving substances. Thus tar oils are solvents for anthracene; water, for zinc chloride; benzol, for tar oils.

sound — Free from decay.

sound Southern yellow pine — See hard pine.

sound square edge — A grade of timber free from decay and well manufactured and in the inspection of which the proportion of heart and sapwood is disregarded.

sound wormy — A term applied to a grade of oak and chestnut lumber that contains small worm holes, but is free from decay.

Southern yellow pine — See hard pine.

Southern yellow pine — This term includes the species of yellow pine growing in the southern states from Virginia to Texas, that is, the pines hitherto known as longleaf pine, shortleaf pine, loblolly pine, Cuban pine and pond pine.

Under this heading, two classes of timber are designated: (a) dense Southern yellow pine and (b) sound Southern yellow pine. It is understood that these two terms are descriptive of quality rather than of botanical species.

(a) Dense Southern yellow pine shall show on either end an average of at least six annual rings per inch and at least one-third summerwood, or else the greater number of the rings shall show at least one-third summerwood, all as measured over the third, fourth, and fifth inches on a radial line from the pith. Wide-ringed material excluded by this rule will be acceptable, provided that the amount of summerwood as above measured shall be at least one-half.

The contrast in color between summerwood and springwood shall be sharp and the summerwood shall be dark in color, except in pieces having considerably above the minimum requirement for summerwood.

(b) Sound Southern yellow pine shall include pieces of southern pine without any ring or summerwood requirement."

Standard Names for Structural Timbers. A. S. T. M.

Spanish oak (*Quercus digitata*) — Hard, heavy, and strong; not durable; checks badly in drying. See red oak.

special butt treatment — Usually consists of total immersion of the pole in heated preservative followed immediately by an immersion of the butt to a point at or above the ground line in cold preservative.

specific gravity — A ratio of the weight of a substance as compared with the weight of an equal volume of water under the same conditions. It is obtained by weighing accurately measured volumes of the substance and of water; by measuring the loss in weight of a body immersed in the substance (if liquid) and in water or by gauging the amount of liquid displaced by a floating body (hydrometer) and the amount of water displaced by the floating body. In

any case, it is equal to the weight of the substance divided by the weight of an equal volume of water at the same temperature.

In timber specific gravity indicates the density. Obviously, the weight of wood in a given volume changes with the shrinkage and swelling caused by changes in moisture. Consequently, specific gravity is an indefinite quantity unless the circumstances under which it is determined are specified.

The term as used in the wood preserving industry frequently refers to relative gravity rather than true specific gravity. In this case the preservative is weighed at a convenient temperature, usually 38° C. and compared with the weight of water at 15.5° C. This is more properly expressed as specific gravity 38°/15.5° C. Used to determine roughly the general nature of an oil or oil mixture, the higher boiling oils usually being of higher specific gravity than those of lower boiling points.

specific gravity balance — A balance especially designed to determine the loss in weight of bodies suspended in liquids for the purpose of determining the specific gravity of the liquids.

specific gravity bottle — See pyknometer.

specific gravity of fractions — A test required by A. R. E. A. and A. W. P. A. specifications for creosote oils.

Mr. W. H. Fulweiler, Chemical Engineer of the United Gas Improvement Company states: "I have personally done a great deal of work on this particular subject and I think a fair statement of the facts of the matter would be as follows:

(1) Creosote oils made from water gas tar will give a gravity on the fraction of 235° to 315° C. of from 0.98 to 1.015 and on the fraction from 315° to 355° C. of from 1.03 to 1.05.

(2) If the oil is made from coal tar produced in the continuous system of vertical retorts, the respective gravities will be from 0.99 to 1.02 and from 1.05 to 1.065.

(3) If the tar is made in the intermittent system of vertical retorts the respective gravities will be 1.01 to 1.025 and 1.05 to 1.07.

(4) If the tar is made in horizontal retorts, the respective gravities will run from 1.01 to 1.03 and 1.07 to 1.10.

(5) If the tar is made in coke ovens, the respective gravities will run from 1.0025 to 1.035 and 1.09 to 1.105.

The point to be brought out is that gravities are more or less empirical, and that they indicate nothing much except the possible source of the tar from which the oil is made."

Sphæroma — See marine borers.

spline — A small strip of wood designed to fit into grooves in the edges of planking to form a tight joint.

splined planking — Planking with edges grooved to receive splines.

spore print — The impression or pattern obtained by suspending a fungus above a smooth surface as a sheet of paper. The "print"

is made by the accumulation of spores discharged from the fungus and is used to determine the color of the spores in identifying fungi.

spores — The reproductive bodies of fungi corresponding in function to the seeds of the higher orders of plants.

spot test — See blotter test.

spray treatment — One in which the preservative is applied to the surface of the wood in the form of a fine mist or spray. A paint machine is generally used.

Sprengel tube — An instrument used for the measurement of exact quantities of liquids in determining their specific gravities.

springwood — The inner, more porous portion of an annual ring consisting of wood formed in the spring. In ring-porous woods the springwood contains the large vessels or pores. Known also as earlywood.

spruce (Picea) — There are four American species of spruce, the most important in the eastern states being the black and the white spruce. The commercial classification of black and white spruce is not identical with the botanical. Commercial white spruce is simply wide ringed wood and black, narrow ringed of both botanical species. Douglas spruce is not a true spruce but is more like hemlock. Resembles soft pine, is light, stiff, very soft, moderately strong, less resinous than pine; has no distinct heartwood, and is of whitish color.

Used for poles, lumber and ties. Not durable. White spruce (*Picea canadensis*) very difficult to treat. Engelmann spruce (*Picea engelmanni*) takes treatment readily. Sitka spruce (*Picea sitchensis*) takes treatment well. Red spruce (*Picea rubens*) takes treatment with difficulty.

Spruces, like pines, form extensive forests; they are more frugal, thrive on thinner soils, and bear more shade but usually require a more humid climate. Black and white spruce as applied by lumbermen, usually refer to narrow and wide ringed forms of the black spruce (*Picea nigra*). In "Diseases of New England Conifers" Dr. von Schrenk associates numerous fungi with living and dead spruce trees. "The term 'spruce' is to cover Eastern spruce; that is, the spruce timber coming from points east of and including Minnesota. The term "Western spruce" is to cover the spruce timber from the Pacific coast." Standard Names for Structural Timbers, A. S. T. M.

square — Term used by builders and architects to designate a surface of 100 square feet usually applied to shingles, roof coverings and plastering.

square edge and sound — See sound square edge.

squared tie — A tie hewed or sawed on top, bottom and sides. (Known also as "pole" tie, "squared-pole" tie, and "rectangular" tie; and may be "rifle" or "target" tie, "half-moon" or "halved" tie, "heart-and-back" or "wing" tie, "boxed-heart" tie or "quartered" tie.) A. R. E. A.

stacker — See tie stacker.

stain test — See ferric thiocynate stain test, Iodine-Potassium Ferricyanide Stain Test, and penetration.

stanchion — An upright bar, post or timber serving to support a structure or hold it in place. A post supporting a deck, beam or awning. A prop supporting the end of a stall. Vertical bars used to hold cattle in a stall.

Standard — A grade of timber described as follows in the 1918 Interstate Rules for the Classification and Inspection of Yellow Pine Lumber: "All lumber shall be sound, sap no objection. Wane may be allowed one-eighth of the width of the piece measured across face of wane, extending one-fourth of the length on one corner, or its equivalent on two or more corners, provided that not over 10 per cent of the pieces of any one size shall show such wane. See Interstate Rules of 1916 and amendments of March, 1918, which contain a density requirement.

Standard Defects — The standard defects of structural timber as listed in American Society of Testing Materials Standards, and Proceedings of the American Railway Engineering Association are as follows:

1. Sound Knot — A sound knot is one which is solid across its face and is as hard as the wood surrounding it. It may be either red or black and is so fixed by growth or position that it will retain its place in the piece.
2. Loose Knot — A loose knot is one not firmly held in place by growth or position.
3. Pith Knot — A pith knot is a sound knot with a pith hole not more than ¼ inch in diameter in the center.
4. Encased Knot — An encased knot is one which is surrounded wholly or in part by bark or pitch. Where the encasement is less than ⅛ of an inch in width on each side nor exceeding one-half the circumference of the knot, it shall be considered a sound knot.
5. Rotten Knot — A rotten knot is one not as hard as the wood surrounding it.
6. Pin Knot — A pin knot is a sound knot not over ½ inch in diameter.
7. Standard Knot — A standard knot is a sound knot not over 1½ inches in diameter.
8. Large Knot — A large knot is a sound knot, more than 1½ inches in diameter.
9. Round Knot — A round knot is one which is oval or circular in form.
10. Spike Knot — A spike knot is one sawn in a lengthwise direction. The mean or average diameter shall be taken as the size of these knots.
11. Pitch Pocket — Pitch pockets are openings between the grain of the wood, containing more or less pitch or bark. These shall be classified as small, standard and large pitch pockets.
    (a) A small pitch pocket is one not over ⅛ of an inch wide.
    (b) A standard pitch pocket is one not over ⅜ of an inch wide nor over 3 inches in length.
    (c) A large pitch pocket is one over ⅜ of an inch wide, or over 3 inches in length.

12. Pitch Streak — A pitch streak is a well-defined accumulation of pitch at one point in the piece. When not sufficient to develop a well-defined streak, or where the fibre between grains, that is, the coarse grained fibre, usually termed "springwood" is not saturated with pitch, it shall not be considered a defect.
13. Wane — Wane is bark or the lack of wood from any cause on edges of timbers.
14. Shakes — Shakes are splits or checks in timbers which usually cause a separation of the wood between annual rings.
15. Rot — Dote — Red Heart — Any form of decay which may be evident either as a dark red discoloration not found in the sound wood or the presence of white or red rotten spots, shall be considered as a defect.
16. Ring Shake — A ring shake is an opening between annual rings.
17. Through Shake — A through shake is one which extends between two faces of a timber.

standard lengths — In rough southern yellow pine, multiples of 2 feet from 4 to 24 feet. In dressed stock, multiples of 1 foot from 3 feet to 20 feet. For hardwood lengths see Rules of National Hardwood Lumber Association (Chicago).

staving — Planks driven vertically to form a retaining wall as curbing for preserving shore line or bodies of water, etc., similar in form and use to sheet piling but lighter.

steaming — Subjecting green or wet timber in a treating cylinder to live steam for the purpose of artificial seasoning. Many authorities while agreeing that steaming facilitates the introduction of preservatives claim that the moisture content of seasoned wood is increased rather than decreased by it. See "Strength of Wood as Affected by Moisture and by different Methods of Drying," by H. D. Tiemann. Also "Steaming of Lumber before and during Kiln Drying," by W. K. Loughborough.

steam seasoning — See steaming.

steeping — Consists in submerging the timber in a solution of a water-soluble preservative and allowing it to soak for a period of time, depending upon the size of the sticks. In some cases the soaking period is set at one day for each inch in thickness, and one day in addition to this total. Proceedings American Wood Preservers Association, 1921, page 176.

Stereum fasciatum — A saprophytic fungus rotting hardwood timbers, both heart and sapwood. Family Thelephoraceæ, having neither gills, pores or teeth. Fruiting bodies are thin gray or slate colored shelves arranged one above another and projecting 1 to 1½". Upper surface somewhat velvety, lower surface smooth and light brown.

Stereum frustulosum — A fungus destructive to oak timber. Produces decay in pockets or holes separated by sound wood. Family Polyporaceæ. Fruiting body, small, hard, gray, elevated spots in masses looking much like sheets of dried cracked mud.

Stereum rameale — A saprophytic fungus attacking the less resistant hardwoods, particularly the gums and is very common. Family Thelephoraceæ. Fruiting bodies yellow and hairy above, orange and smooth beneath, thin flexible and small (rarely over ½") appearing in great numbers, overlapping and often joined together to form a long shelf.

sterile — steril — Without power of reproduction. Containing no living micro-organisms. Timber is said to be sterile when it contains no viable fungous mycelium or spores.

sterilizing — Any process or portion of a process which kills fungus growth existing on or in the timber at the time of treatment.

sticker — See separating strip.

still — A vessel in which a liquid is vaporized in the process of distillation. See retort.

stockboards — Boards in even widths usually 8 inches, 10 inches and 12 inches.

stock widths — Lumber cut in even widths from 4 inches to 12 inches. Hardwoods are customarily cut to maximum width irrespective of whether this falls on an odd or an even inch or between it.

storage yard — Ground space for storing timber or ties in suitable piles for seasoning or after treatment.

straight-run pitch — A pitch run to the consistency desired, in the initial process of distillation without subsequent fluxing. A. S. T. M.

strain — The deformation or distortion produced by a stress or force is known as strain.

strength — The term "strength" as ordinarily used is a very indefinite one. It is usually thought of in connection with external loads or forces. Strength in its broad sense is a measure of the mechanical properties, or of the ability of a timber to resist stress or deformation. Thus, strength in shear, strength as a beam, strength as a post, hardness, stiffness, toughness. These last three properties are not always thought of in connection with the term strength, but are unconsciously included whenever they are important in a specific use. See tensile strength and crushing strength. Also "Effect of Moisture Upon the Strength and Stiffness of Wood," by H. D. Tiemann, in Bulletin 70, U. S. Forest Service, and Bulletin 108, "Tests of Structural Timbers."

stress — Stress is distributed force. Fiber stress is the distributed force tending to compress, tear apart, or change the relative position of the wood fibres. Stress is measured by the force per unit area. Thus a short column 2 inches square (4 square inches) and supporting a load of 2,000 pounds will be under a stress or fiber stress of 500 pounds per square inch.

stringer — A long horizontal timber to connect uprights in a frame or to support a floor. A longitudinal timber supported by cross ties as in a bridge or trestle. A guard rail.

strip count — Term applied to the method of measuring dressed lumber in which the dimensions given are those of the full size of rough material used in its manufacture. The actual dimensions of dressed lumber may be dependent upon the size and grade, from 3/16 inch to ¾ inch less than the strip count measurement.

structural timber — Permanent timber used in the framework of various structures. This term is often incorrectly used for dimension sizes regardless of their use. See "Tests of Structural Timbers," Forest Service Bulletin 108; "Das Holz als Baustoff," by G. Lang.

stubbing pole — A short pole or post placed in the ground to which a pole is spliced. Frequently used where the butt of a pole has been rotted away. The lower portion including the decayed wood is cut off and the sound upper portion is attached to a stubbing pole.

studding — The vertical members in any house wall whether partition or outside.

submerging device — A device consisting of weights, weighted grating or removable braces to keep timbers completely immersed during treatment in an open tank.

sugar pine (*Pinus lambertiana*) — Light, soft and easily worked; resembles white pine. In fact this is the "white pine" of the Pacific coast. See soft pine.

sulphonation residue — unsulphonated residue — The portion of an oil not acted upon by sulphuric acid to form sulphonic acids. The presence of an unsulphonated residue presumptively indicates the presence of foreign substances in the oil as impurities or adulterants Mineral oils are detected in coal tar oils in this way. "All coal tar distillates are not sulphonated. The aromatic and unsaturated hydrocarbons are sulphonated, but the paraffin and mapthlene hydrocarbons are not sulphonated and depending upon the kind of coal and the type of carbonizing process used, coal tars may contain several per cents of unsulphonated hydrocarbons. In fact, some of the vertical retort tars contain even higher percentages of unsulphonated materials than some water gas tars, so that the test is not a criterion for the presence of impurities or adulteration." W. H. Fulweiler.

summerwood — The outer, denser, fibrous portion of an annual ring consisting of wood formed during the summer and early fall Known also as latewood.

superficial foot — See surface measure.

Supplementory treatments — See maintenance treatments.

surcharged — See saturated.

surfaced — See dressed timber.

surface area — The area through which preservatives must enter the wood. This varies with its dimensions. Thus 1,000 ft. B. M. of 1 x 2 has 3,000 sq. ft. of lateral surface area, while 1,000 ft. B. M. of 12 x 12 has only 350 sq. ft. For this reason more consistent and uniform treatments are obtained by specifying absorption per unit of surface rather than per unit of volume.

surface measure — (a) The area of one face of a board or structure as a floor or wall. When the material is 1 inch thick this is equivalent to board measure.

(b) The entire surface area of a piece of timber including ends and framed surfaces. This is the sense in which the term is used in estimating on preservative treatment of timber before erection.

(c) The entire exposed surface of a structure already erected, to which preservative may be applied.

surface tension — The contraction of a liquid surface to a minimum due to the potential energy present and decreasing with rising temperature. It manifests itself by the resistance offered by the surface of the liquid to the entrance of other substances of heavier specific gravity. The efficiency of a waterproofing surface is evidenced by the phenomena of surface tension. D. D. Berolzheimer.

surface treatment — A coined term used to designate a preservative treatment accomplished without the assistance of artificial pressure or vacuum. Brush, spray and open tank treatments, which see.

swab — A term used to describe the application of preservatives with a brush or a mop to the ends of creosoted piles after framing or for creosoted timbers that have been cut into and where untreated wood is exposed.

sweating — See bleeding.

sweet gum (1) (*Liquidambar styraciflua*) — See gum.

switch box — A box or case to contain and protect electric switches.

switch ties — Cross ties placed at and adjacent to switches. They are used in sets of graduated lengths from standard to slightly over twice standard length.

sycamore (Platanus) — The wood afforded by American sycamores has unusually complicated structures. Is tough and strong but difficult to work. Two species occur in North America (*Platanus occidentalis*) is a native of eastern North America; (*Platanus racemosa*) a native of western North America. Occasionally used for ties. Not durable when exposed. Owing to its structure treats with difficulty. Grows to very large trees. Hough mentions a tree 29 feet 7 inches in circumference.

tamarack (Larix) — Also called larch and hackmatack. There are two American species, the eastern (*Larix americana*), and western (*Larix occidentalis*) tamarack. Wood, except for strength values, like the best of hard pine, both in appearance, quality and uses, and owing to its great durability, somewhat preferred in ship building, for telegraph poles and railroad ties. In its structure it resembles spruce. Heavy, hard and strong. The larches are deciduous trees, occasionally covering considerable areas, but usually scattered among other conifers. Takes treatment fairly, about like longleaf yellow pine. "The term 'tamarack' is to cover the timber known as "tamarack" or "Eastern tamarack," from states east of and including Minnesota" Standard Names for Structural Timbers, A. S. T. M.

tangential section — Any longitudinal section of timber that does not pass through the center or pith of the wood or which is not radial.

taper — Gradual reduction in diameter of round timbers from butt to tip. Usually expressed in inches per foot of length or as one inch in — feet.

tapped tie — A tie made from a tree, the resin or turpentine of which has been extracted before felling. A. R. E. A.

tar — "Tar, in the scientific sense, may be properly defined as a non-aqueous liquid product obtained in the destructive distillation of complex organic matter. Tars vary greatly in character, both chemically and physically. They may be roughly divided into three classes:

Class A. Tars consisting principally of compounds belonging to the aromatic series, and containing well-defined amounts of phenoloids.

Class B. Tars consisting principally of compounds belonging to the aromatic series, but lacking phenoloids.

Class C. Tars consisting principally of compounds belonging to the aliphatic series."

Proceedings American Wood Preservers Assn., 1917, page 280

See creosote, blast furnace tar, coal gas tar, coal tar, coke oven tar, dehydrated tar, filtered tar, gas tar, oil gas tar, refined tar, vertical retort tar, water gas tar.

tar acids — See phenols.

tar acid test — A test to determine the amount of tar acids in coal tar or coal tar distillates. The tar or oil to be tested or certain distillation fractions are subjected to several washings with dilute sodium hydroxide and the washings are acidified with sulphuric acid which causes the tar acids to separate. These are measured in a burrette or graduated cylinder and expressed as a percentage of the whole quantity or, more correctly, of the fractions tested. A chemical test.

tar oils — Oils contained in or derived from coal tar.

tenon — A projecting portion of a timber formed by cutting away the surrounding wood, for insertion in a correspondingly shaped mortise to form a joint.

tensile strength — The longitudinal force required to pull asunder a bar of material having a uniform cross section of 1 square inch. The minimum load per square inch of cross section required to break a bar of material in tension.

Teredo navalis — ship worm — See marine borers.

terminal box — A box or case used to protect the terminals of electric cables or other conductors.

termites — white ants — These insects are not ants nor are they related to the ants in any way. They have been called ants, however, because they have certain social habits similar to true ants. They are most abundant in the tropics but there is a northern species that lives in old logs or stumps or under stones in the ground.

All termites avoid the light and build covered passage ways through which they go from place to place. They feed upon wood, eating out the entire interior and leaving only an outer shell. Termites do an appreciable amount of injury to poles and to buildings in the U. S. They also do considerable damage to orange and other trees by girdling them below the surface of the ground. See "White Ants," by T. E. Snyder, Farmers Bulletins 1037, U. S. Dept. of Agriculture.

Thelephoraceæ — Fungi with smooth under surface comprise the Thelephoraceæ. This is a very large family but of its 1,100 specie only a few are parasites.

thermal death point — The minimum temperature above which a fungus cannot live.

thermometer — An instrument for measuring temperatures — see Centigrade, Fahrenheit, pyrometer, Réaumur.

thermometer, armored — A glass thermometer surrounded by a protecting metal or wooden guard or sheath.

thermometer guard — A cage, usually of perforated metal or wood, fastened to the interior of a treating tank, to protect a thermometer from damage by timbers during treatment.

thermometer well — A tube or pocket in the wall of a treating tank or cylinder, opening on the outside and closed at its inner end. Designed to receive the bulb of a thermometer. The tube should be a good conductor of heat and be completely surrounded by preservatives. Used in determining the temperature of the preservative in the tank or cylinder.

thief — A small container by means of which a sample may be taken at any desired point in a tank or continuously while the thief is moved about in the liquid. See barrel thief.

tie — cross tie — sleeper — Transverse timbers on which rails are fastened in a railroad track. Standard sizes are 6 inches by 8 inches by 8 feet and 7 inches by 9 inches by 9 feet 6 inches, the former for electric roads and steam roads for light traffic, the latter for steam roads with heavy traffic. For definitions of various ties see 1921 and previous Proceedings of American Railway Engineering Association and Specifications of National Association of Railroad Tie Producers. The standardization of cross and switch ties has now been undertaken by the American Engineering Standards Committee.

See also

bored tie
box-heart tie
bridge tie
half-moon tie
halved tie
heart-and-back tie
heart tie
machined tie
pole tie
quartered tie
rectangular tie
sap tie
slab tie
squared tie
switch tie
tapped tie
wane tie

tie loader — A machine consisting essentially of a portable conveyor for carrying ties from storage piles or tram cars into freight cars for shipment. See Angier tie loader, Proc. American Wood Preservers Assn., 1920, page 201.

tie plate — A plate of metal or wood placed between the rail and cross tie to take up mechanical wear and prevent the wearing away of the tie under the rail.

tie plug — See plug.

tie specifications — See Standard Specifications for Cross Ties of American Railway Engineering Association and Specifications for Cross Ties of National Association of Railroad Tie Producers.

tie stacker — A machine consisting essentially of a portable conveyor, the delivery end of which can be raised or lowered, used in carrying ties and placing them in stacks or piles for seasoning or storage.

timber — (a) Sawed material 4 inches by 4 inches or more in dimension.

(b) The term timber may apply to standing trees, logs or trunks of trees cut and squared, suitable for manufacture into lumber. It may also refer to the wood used in the frame of a ship or building or to the wooden portion of a composite structure. In general it refers to the larger sizes of sawed wood and rarely to the smaller sizes or manufactured material.

titration — A process used in volumetric analysis by which the strength of a solution is determined by comparing the quantity of reagent required to produce a color reaction or precipitation in it as compared with a similar standard solution of predetermined strength. Frequently used in determining the chlorine content of chlorinated oils. See "A New Method of Estimating Bromine and Chlorine in Organic Compounds," by P. W. Robertson, Journal of The Chemical Society (London), June 1915.

toadstool — See mushrooms.

ton — A European timber unit equal to 480 feet B. M. or 40 cubic feet.

tongue and groove (T and G) — Lumber provided with a tongue on one edge and a groove on the other into which the tongue of the adjacent piece fits to make a tight joint. Used chiefly in flooring and ceiling.

tower — (Line Construction). A structure consisting of several columns effectively interconnected by bracing so as to function as a unit in supporting conductors at a desired height. See pole.

toxic — Poisonous. In wood preservation, capable of killing wood destroying organisms both vegetable and animal.

toxicity — The degree or extent to which a substance is toxic or poisonous to wood destroying organisms. See phenol coefficient.

tracheids — Elongated taper pointed wood cells, especially such as are marked with bordered pits as in the pine family. See Bailey

"The Effect of the Structure of Wood upon its Permeability" Bul. 174 A. R. E. A.

tram — See car.

Trametes pini — A heart rotting fungus attacking coniferous trees producing pocket rot and red heart. Family Polyporaceæ. Fruiting body hoof or shell-shaped bracket. Develops slowly in cut timber placed in damp situations.

Trametes sepium — A saprophytic polyporus fungus appearing on oak and chestnut where it causes a very severe and destructive rot. Family Polyporaceæ. The decayed wood readily crumbles between the fingers. Fruiting body small, white, tough and dry, becoming pale buff and hard. The pores are rather large and easily visible.

Trametes serialis — A fairly widely distributed and dangerous fungus attacking coniferous timbers in buildings. Family Polyporaceæ. Fruiting body exceedingly variable in form, small, corky, upper surface rough, rusty brown, under surface whitish, medium size pores.

transverse section — A cross section. A section of timber cut at right angles to the axis, pith or grain of the stick.

treated oils — Oils that have received chemical treatment other than distillation during the process of manufacture. Oils that have been modified chemically during the process of manufacture.

treating at the hole — Treating poles at the point of erection by means of a portable treating outfit. Usually brush treatment.

treating cylinder — Metal cylinder capable of receiving timber to be treated and of being closed hermetically to hold the preservative under pressure during treatment. A retort.

trestle — An open braced frame work for the support of a railroad track or other structure.

trestle timbers — Stringers, caps, posts, mud sills, bracing, bridge ties, guard rails. A. S. T. M.

tripod — A hoisting device consisting of three legs fastened together at the top and provided at this point with a pulley. Placed over an open tank to facilitate handling timbers into and out of the preservative bath.

trolly hoist — A hoisting device suspended from an overhead track thus affording lateral movement. Placed over treating tanks to facilitate charging and discharging.

trunking — See signal trunking.

tupelo — See gum.

Tyloses — Tyloses are outgrowths of the cell walls which occur just before the wood changes from sapwood to heartwood. They fill up and plug the vessels and resin ducts of many kinds of trees but are absent in others. Their presence may prevent or greatly hinder the entrance of preservative liquids into the heartwood of timber making it more difficult to treat than the sapwood. Particularly

abundant in white oak and black locust. See "Tyloses: Their Occurrence and Practical Significance in some American Woods," by Eloise Gerry.

ullage — The quantity short of the full capacity of a tank or vessel. Outage.

understructure — The supporting frame work of a structure as a trestle, the foundation timbers of a building, support of a tank, etc

vacuum — A diminution of pressure below normal atmospheric as in a condenser or suction pump. Suction. Usually measured as the height in inches or centimeters to which it will suck a column of mercury. In a perfect vacuum this height is approximately 30 inches.

vacuum process — A term used indiscriminately to designate any of the pressure processes that employ a vacuum at some stage of the treatment. See vacuum pump.

vacuum pump — A suction pump used to obtain reduced atmospheric pressure in a treating cylinder for the purpose of withdrawing con densed steam, sap or as in the Lowry Process to recover excess preservative.

Valparaiso oak (1) (*Quercus chrysolepis*) — See live oak.

vegetable mold — See humus.

vertical retort tar — A low temperature coal tar obtained from the production of illuminating gas in vertical retorts. It contains more parafinoid bodies than coal tar from horizontal retorts or by-product coke ovens. It approaches blast furnace tar in composition. Vertical retort tar is more fluid than coke oven tar, and is comparatively low in free carbon. Naphthalene is practically absent. Its tar acid content and sulphonation residue are high.

vessel — Vessels are tube-like elements present in wood. Their function is to facilitate the ascent of water in the stem of the plant. When their activity as water-carriers lessens or ceases, i.e., when wood changes from sapwood to heartwood, they frequently become plugged by outgrowths from surrounding cells. See Tyloses. In length, vessels are often equal to the entire length of the plant. In cross section, vessels are seen as large hollow cells or tubes known as pores.

viscosimeter — An instrument used to determine the viscocity or reluctance to flow in liquids. They are of various types based on the rate of flow of the liquid through a fine tube or opening or upon the friction of a body moving in the liquid. The standard Engler viscosimeter consists of a water jacketed receptacle for holding the oil, provided with a small opening in the bottom through which 200 cubic centimeters of the sample are allowed to flow at a fixed temperature. The time is measured to fifths of a second and compared with the time required by pure water at the same temperature.

viscosity — Reluctance or resistance, by internal friction, to flow. As used by wood preservers it serves as an indication of the probable penetration of an oil. See "Relation Between Viscocity and Penetrance of Creosote into Wood," by E. Bateman, Chem. & Met. Engrg., Vol. 22, No. 8 (1920).

visual penetration test — See penetration.

volatile oils — Oils that evaporate or vaporize at atmospheric or relatively low temperatures.

volatility — The power to vaporize or evaporate in the air particularly when this occurs at ordinary temperatures or at temperatures only slightly above normal atmospheric.

volume — temperature correction factor — See coefficient of expansion.

vulcanizing — Process of hardening or toughening wood by heating under pressure. At one time employed as a wood preserving process. The Haskins Process claimed to produce a partial distillation as a result of a heat treatment and so render wood antiseptic.

wane — See Standard Defects.

wane tie — A squared tie showing part of the original surface of the tree on one or more corners. A. R. E. A.

warping — Twisting or distortion of wood resulting from heating or uneven drying.

water gas tar — Tar produced in the manufacture of carburetted water gas by the decomposition of petroleum oil by heat in the presence of blue gas. Water gas tar differs from the tar produced in by-product coke ovens and gas retorts by having a very much smaller percentage of free carbon, no appreciable quantity of tar acids and by the fact that the fractions of the same boiling range will have lower specific gravities. Some vertical tars have more paraffin hydrocarbons than water gas tars. W. H. Fulweiler. Also frequently called oil tar.

water gas tar oils — Oils obtained by distillation from water gas tar.

water oak — See pin oak, red oak.

water thief — A glass tube provided with a valve at the lower end used in sampling contents of tanks to determine the amount of water collected on the surface of the oil.

weathering — The erosion, mechanical wear or abrasion of the surface of timbers exposed to the elements, caused by particles of sand, etc., carried by the wind, frost, and the solvent action of rain water.

Wellhouse Process — Known as the Zinc-Tannin Process. A pressure process consisting of the following steps or movements: (a) Preliminary steaming of several hours followed by vacuum. (b) Solution of 1½ to 3 per cent zinc chloride and ½ per cent of glue injected under about 125 pounds pressure in 3 to 6 hours. (c) Excess preservative drained off and solution of ½ per cent tannin is injected under 125 pounds pressure in 2 hours. The tannin com-

bines with the glue forming a leathery plug to retain the zinc chloride in the timber. Process later modified by introducing glue and zinc chloride separately and by increasing strength of zinc chloride solution. First used 1881. Patented 1879 in U. S. A. Employed with considerable success by the late Octave Chanute.

Western yellow pine (*Pinus ponderosa*).

Nomenclature: big pine, bull pine, longleaved pine, red pine, pitch pine, heavy pine, foothills yellow pine, Montana black pine.

Trees very large, 100 to 300 feet high, 6 to 12 feet in diameter. Always grows at elevation above 1,800 feet. Thin light red heartwood, sapwood nearly white. Wood coarse grained, compact, variable, heavy, hard, strong and brittle, but not durable. Used for lumber, ties, mine timbers, etc. Takes treatment about as readily as shortleaf pine (*Pinus echinata*). "The term "western pine" is to cover the timber sold as white pine coming from Arizona, California, New Mexico, Colorado, Oregon and Washington. This is the timber sometimes known as "Western yellow pine" or "ponderosa pine" or "California white pine" or "Western white pine." Standard Names for Structural Timbers, A. S. T. M. See pine.

wet and dry — See dry and wet.

wet rot — Decay or rot which occurs in damp or wet situations or in which the decayed wood is moist.

white ants — See termites.

white cedar — Arbor vitæ (*Thuya occidentalis*), canoe cedar (*Thuya gigantea*), white cedar (*Chamæcyparis thyoides*), Port Oxford cedar (*Chamæcyparis lawsoniana*), yellow cedar (*Chamæcyparis nootkatensis*), incense cedar (*Librocedrus decurrens*). See cedar.

white oak — The harder, denser and more durable of the oaks including the true white oak (*Quercus alba*), cow oak (*Quercus michauxii*), is chestnut oak (*Quercus prinus*), post oak (*Quercus minor*), bur oak (*Quercus macrocarpa*) and the Pacific post oak (*Quercus garryana*).

Wood is ring porous, tough, hard, strong and heavy. Heartwood brown, sapwood lighter, medullary rays and annual rings prominent and well marked. Usually close grained and dense. Easily split and checks badly unless carefully seasoned. Used in ship building, construction and ties. Very durable even under unfavorable conditions. Takes treatment with difficulty. See chestnut oak.

white pine (*Pinus strobus*) — Soft and uniform; light and weak; seasons well. Shrinks, swells and warps less than other pines. Is quite durable in exposed positions. "The term 'white pine' is to cover the timber which has hitherto been known as white pine, from Maine, Michigan, Wisconsin and Minnesota." Standard Names for Structural Timbers, A. S. T. M. See Idaho white pine; soft pine.

whitewood (Liriodendron) — The tulip tree (*Liriodendron tulipifera*) is the sole surviving species of its genus. For description of wood see poplar.

wind-and-water-line — See optimum moisture condition.

wood destroying fungi — Fungi which derive their food from wood causing it to decay or rot.

wood louse — The term wood louse is applied locally in the United States to the white ants or termites. Any of a number of small terrestrial crustaceans of the genus Oniscus or Armadillo including the sow bugs and pill bugs. They are frequently found in damp situations, in decayed wood and under bark and sometimes cause damage to the roots of young plants. They are not known to attack timber. See also marine borers.

wood preservation — The art of protecting wood against decay and the attack of boring animals. See "The Preservation of Timber," Trans. American Society of Civil Engineers, 1885.

wood tar creosote — A creosote derived from a tar produced by the destructive distillation of wood. See creosote.

Xylariaceæ — A small family of over 500 species. Most of these are saprophytic on wood or bark. Belongs to the ascomycetes. Spores are borne in sacs.

xylenols — See cresols.

Xylotria — See marine borers.

yard — A term used in reference to paving, flooring, etc., to denote a square yard of surface.

yellow pine — See hard pine, pine.

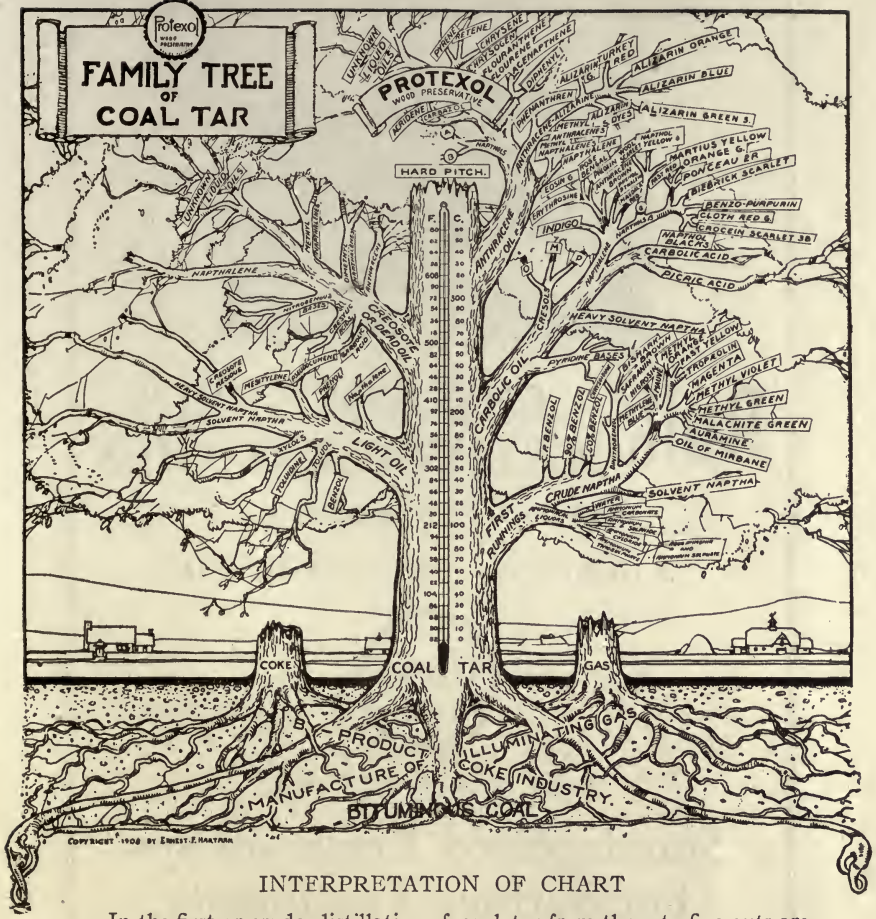
Z-hook — See S-hook.

zinc chloride — A salt formed by the action of hydrochloric (muriatic) acid on zinc. Recommended by Thomas Wade in 1815 and by Dr. Boucherie in 1837. Used in water solution in the Burnettizing Process.

zinc creosote — See Card Process. See "Preservation of Timber," by S. M. Rowe.

zinc fluoride — See fluoride.

zinc tannin — See Wellhouse Process.



INTERPRETATION OF CHART

In the first or crude distillation of coal tar from three to five cuts are made. The temperatures at which the main branches distil are shown by the adjacent thermometer scale. From this, however, the boiling points of the individual compounds cannot be inferred since many do not distil at all but are decomposed before they volatilize.

REFERENCE LIST OF PRODUCTS:

Acid Coal Tar, Crude
Anthracene Oils
Benzol
Coal Tar Acids, Crude (all strengths)
Coal Tar Pitch
Creosote Oils
Cresylic Acid
Dead Oil of Coal Tar
Disinfectant Detergent
High Flash Naphtha
Metal Dip
Naphthalene
Neosote Wood Preservatives
Neutral Oil
Osco Creosote Oil
Pale Heavy Naphtha
Preservative Black Varnishes
Protexide Colorless Preservatives
Protexol Wood Preservatives
Protolene Stains
Roof Cement
Sanitary Fluid
Shingle Oils
Soluble Disinfectants
Solvent Naphtha
Tar Coating and Roof Coating
Toluol
Water Proof Coatings
Weed Killer
Xylol

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